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JULY 2000

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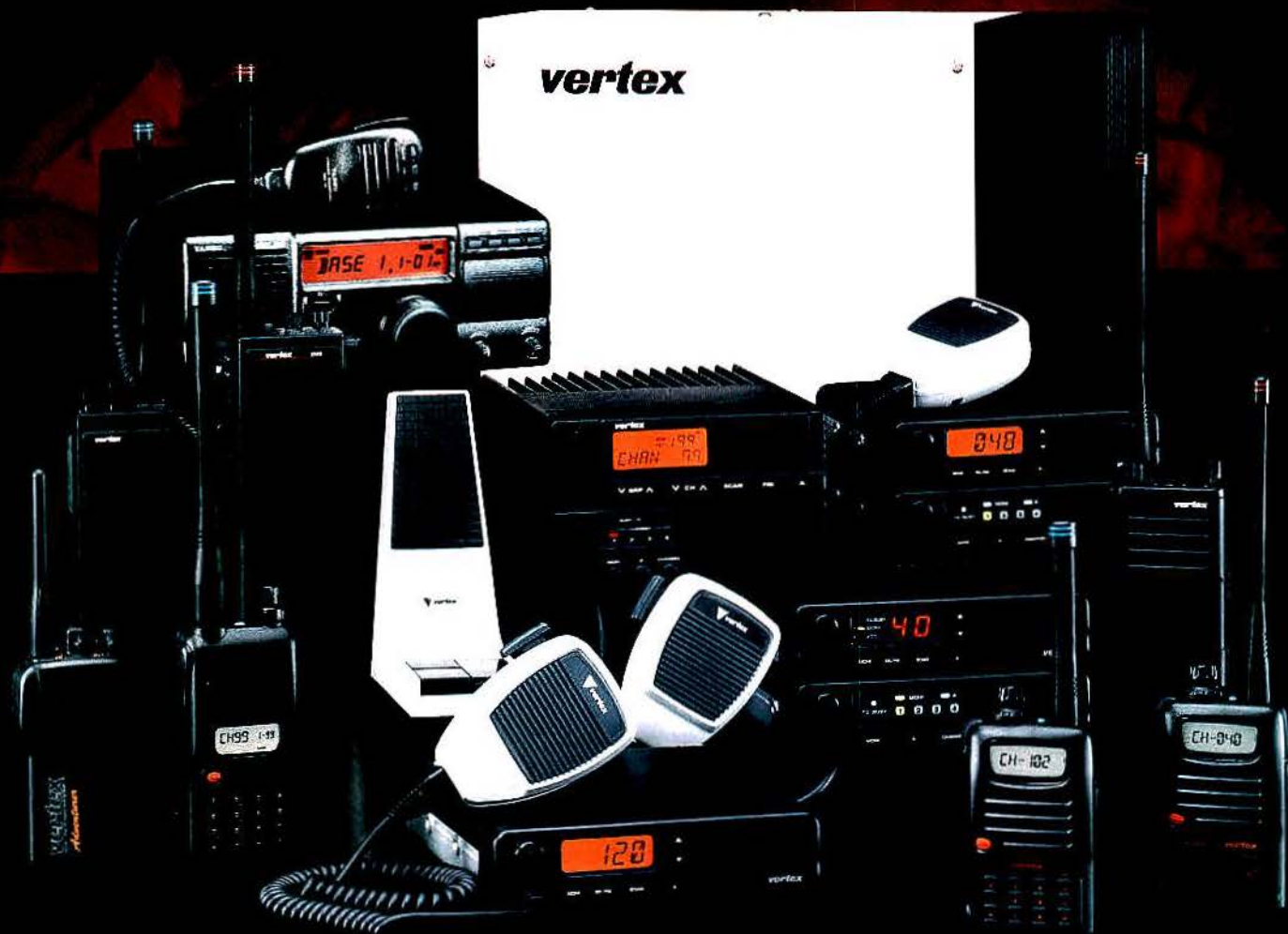
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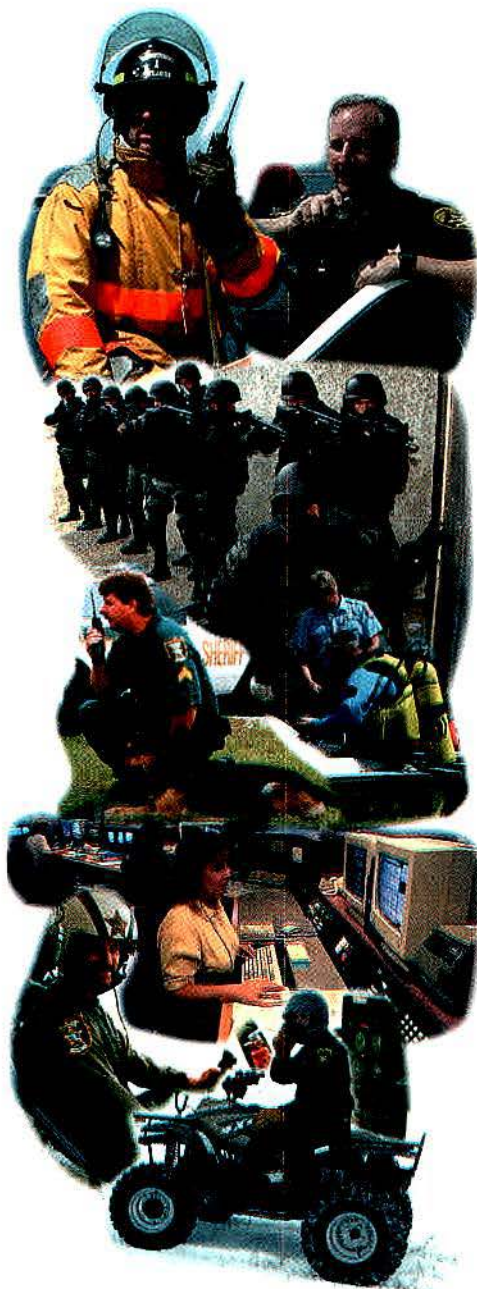
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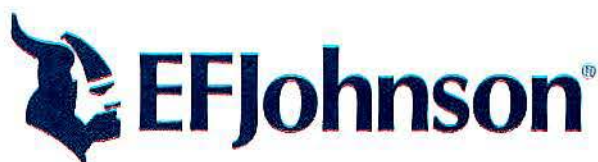
**Our position is clear:** Nobody knows better how public safety communications should work than the people who use it. These dedicated professionals have spent nearly a decade shaping their vision of how public safety communications will work in the future—the APCO-initiated Project 25 suite of standards. E.F. Johnson respects and applauds their efforts.

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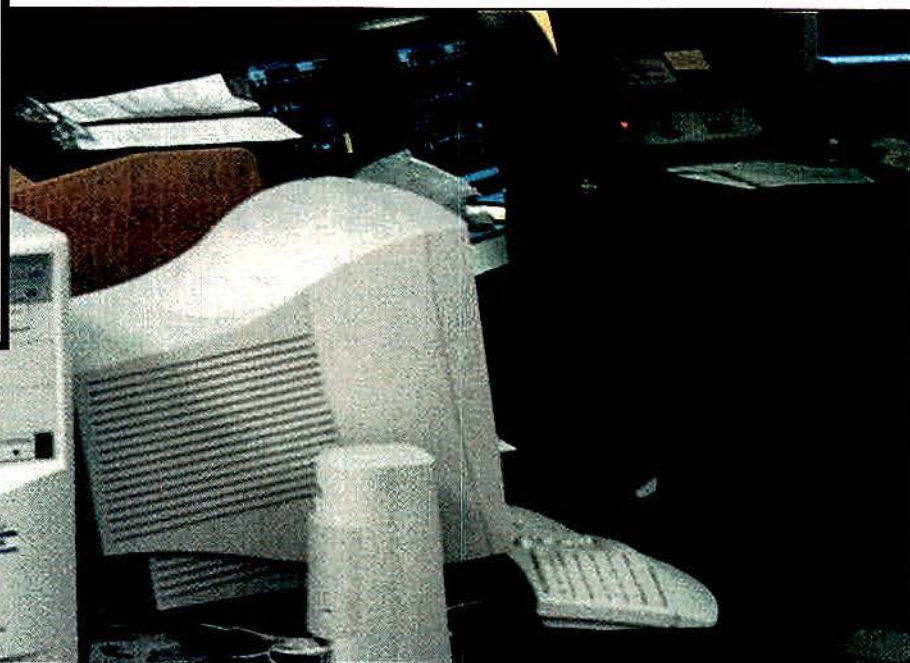
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July 2000



**On the cover:** The control room at Hoover Dam coordinates radio communications, security and power operations. See the story on page 32. Cover design by Scott Dolash, art director. Photography by Tec Images Alaska.

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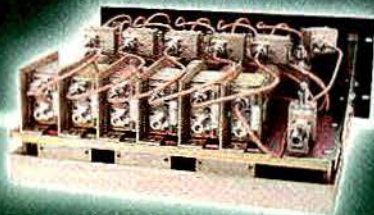
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## The view on the other side of the pond

"Integration" dominated presentations at the British Association of Public-Safety Communications Officers' (BAPCO) second annual conference in London, May 10-11.

Integration refers to control room consolidation of dispatching for multiple agencies. (What we refer to as a call center, dispatch center or public safety answering point, the British call a control room.) Horizontal integration consolidates dispatching for multiple agencies of the same type in one control room and usually covers a region. Vertical integration combines dispatching for two or more types of agencies (usually police service, fire brigade or ambulance trust), generally for a local area.

In contrast, issues that rivet public safety officials in the United States usually involve technology and frequency assignments.

For example, despite reaching milestones in setting standards and implementing frequency-division, multiple access (FDMA) technology for digital systems, many manufacturers insist that some of their users want time-division, multiple-access (TDMA) technology. Ericsson has championed TDMA as the industry's brightest lights have devoted enormous resources to develop a U.S. digital standard under a process named Project 25 by the Association of Public-Safety Communications Officials—International (APCO).

A few months ago, APCO agreed to consider adding two TDMA technologies to Phase II of Project 25: Ericsson's proposed two-slot TDMA technology and the existing four-slot TDMA technology embodied in the Terrestrial Trunked Radio (TETRA) protocol widely used first in Europe.

Motorola has said that most of its digital public safety radio users in other parts of the world want TETRA, whereas most of its U.S. users say that they want FDMA. That, Motorola has said, led the company to support FDMA during the Project 25 process that developed a standard along the lines of the company's Astro digital technology. In meeting after meeting, TDMA proposals were considered and turned aside.

Companies selling TETRA equipment have signed a memorandum of understanding (MOU) that requires them to license TETRA intellectual property

rights (IPR) to one another under fair and reasonable terms.

In the United States, Motorola is doing well with FDMA Astro and doesn't have to compete with other suppliers on the scale it does elsewhere with TETRA. Motorola has said it doesn't have to license its TETRA IPR for use in the United States because TETRA is a European standard.

"The MOU says nothing about geo-



graphical restrictions," TETRA proponents at BAPCO told me.

Motorola representatives I've spoken to say that the company is perfectly willing to license TETRA IPR if and when TETRA is adopted as a U.S. standard. Rather than trying to force a license from Motorola through litigation based on language in the MOU, TETRA proponents are looking to meet Motorola's limitation by ushering TETRA through U.S. standards processes.

Back in the States, Art McDole, co-chairman of the Project 25 Steering Committee, pointed out that about 80% of U.S. public safety systems have fewer than 50 mobile units. He said that FDMA was the best for serving these small, independent users.

Meanwhile, he explained that TDMA is ideally suited for large systems. "There is a definite place for TDMA in U.S. public safety, but not as a single methodology. It has drawbacks, such as difficulty in working outside of the infrastructure on a unit-to-unit basis, which our users say they must have. The subscriber units are low-power to suit European standards and, consequently, cost less. Battery consumption on portable

units is much higher because TDMA requires linear amplifiers. The cost of the infrastructure, due both to the requirement for more stations and the design, appears to be considerably higher. These considerations led to the adoption of FDMA for Phase I. Phase II is considering two proposals for TDMA as well as an FDMA approach. It is all about what the users want," McDole said.

Meanwhile, in the United Kingdom, with the technology battle long since settled and the issue of multiple equipment suppliers already fully sorted out, some of the attendees fairly chirped their happiness over the uniform communications capabilities offered by TETRA. One of them explained that previously, agency operations had to be defined according to their radio communications availability and segregation resulting from frequency assignments and channel capacities. Now agencies are redefining their operations according to the public need and shaping their use of TETRA talk groups to fit. It's not an easy process because it can disrupt long-standing traditional procedures.

That notion of integration is the one that's really proving to be thorny. It raises questions about compensation, cross-training, work load, relocation, competence and other factors.

Maybe so many interests are involved in public safety communications that no plan can enjoy support from everyone involved. In the United States, the technology question undergoes continuous review. In the United Kingdom, the operational question involving control rooms provides more than enough reason for investigation of possibilities and conflicting proposals.

It's impossible to say whether the U.S. technology question will ever reach a period during which it is considered mostly resolved. Maybe if both FDMA and TDMA technologies are equally available for digital public safety systems, operational questions will lead the agenda. The contrast between the two nations' public safety communications approaches provides ideas for each to use as alternatives.

*Don Bishop*

Editorial Director  
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**PLUS:** Robert H. Schwaninger Jr.'s "In the Public Interest"; Harold Kinley's "Technically Speaking"; David Dunford's "Public Safety: 10-2"; editorial commentary from Don Bishop and David Keckler; Product focus—what's new in mobile radios.

### AND IN THE MONTHS TO COME:

Location technologies; antennas for portables; UHF trunking; mobile antennas; installation and maintenance; test shielding.

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## 2000

### June

**25-29: UTC Telecom**, sponsored by UTC, The United Telecom Council, Phoenix. Contact: 202-857-1881 or [www.utc.org](http://www.utc.org).

### July

**16-19: Forestry Conservation and Communications Association National Conference**, Elms Resort & Spa, Excelsior Springs, MO. Contact: 573-751-4115, ext. 172.

### August

**13-17: Association of Public-Safety Communications Officials—International (APCO) National Conference**, Boston. Contact: 904-322-2500 or [www.apco2000.org](http://www.apco2000.org).

### September

**19-22: Fall Vehicular Technology Conference**, sponsored by IEEE Vehicular Technology Society, Seaport Hotel, Boston. Contact: 904-322-2500.

**26-29: PCIA GlobalXChange**, sponsored by PCIA, McCormick Place, Chicago. Contact: 703-739-0300 or [www.pcs00.com](http://www.pcs00.com).

### October

**4-7: Private Wireless Spectrum Management Conference**, sponsored by the Industrial Telecommunications Association, the Council of Independent Communication Suppliers and USMSS, Grand Hyatt Hotel, Washington. Contact: Ray Wisniewski, 703-797-5123 or email [ray@ita-relay.com](mailto:ray@ita-relay.com).

**23-25: AMTEX**, sponsored by the American Mo-

bile Telecommunications Association, Embassy Suites Outdoor World, Dallas. Contact: 202-331-7773 or [www.amtausa.org](http://www.amtausa.org).

### November

**12-15: Telecommunications Resellers Association Fall Conference and Exhibition**, sponsored by TRA, Anaheim, CA. Contact: 202-835-9898 or [www.tra.org](http://www.tra.org).

**15-18: Communications Marketing Conference**, sponsored by the Communications Marketing Association, Sheraton Colony Square, Atlanta. Contact: 404-892-2600, ext. 300 or [www.commktga.com](http://www.commktga.com).

**17: Radio Club of America Communications Symposium, 92nd Anniversary Dinner and Awards Presentation**, New York Athletic Club, New York. Contact: Gerri Hopkins, 732-842-5070.

## 2001

### January

**6-9: International CES**, sponsored by the Consumer Electronics Manufacturers' Association: Las Vegas Convention Center, Las Vegas Hilton, Riviera Hotel and Alexis Park Hotel, Las Vegas. Contact: [www.CESweb.org](http://www.CESweb.org).

### February

**20-23: NATE**, sponsored by the National Association of Tower Erectors, Adam's Mark Hotel, Dallas. Contact: 888-882-5865 or [www.natehome.com](http://www.natehome.com).

### March

**20-22: Wireless**, sponsored by the Cellular Tele-

communications Industry Association, Las Vegas. Contact: 202-785-2842 or [www.wow-com.com](http://www.wow-com.com).

**28-30: International Wireless Communications Expo**, sponsored by Mobile Radio Technology, Las Vegas Convention Center, Las Vegas. Contact: Web site [www.iwceconexpo.com](http://www.iwceconexpo.com).

### April

**1-4: ENTELEC**, sponsored by ENTELEC, New Orleans. Contact: 281-357-8700 or Web site [www.entelec.org](http://www.entelec.org).

### May

**21-24: Telecommunications Resellers Association Spring Conference and Exhibition**, sponsored by TRA, Adam's Mark Hotel, Dallas. Contact: Web site [www.tra.org](http://www.tra.org).

### June

**3-7: Supercomm**, sponsored by TIA and USTA, Georgia World Congress Center, Atlanta. Contact: 800-278-7372.

**24-27: UTC Telecom**, sponsored by UTC, The United Telecom Council, Midwest Express, Milwaukee. Contact: 202-857-1881 or [www.utc.org](http://www.utc.org).

**24-28: NENA**, sponsored by the National Emergency Number Association, Orlando, FL. Contact: Web site [www.nena9-1-1.org](http://www.nena9-1-1.org).

### November

**6-8: Canadian Wireless**, sponsored by the Canadian Wireless Telecommunications Association, Metro Toronto Convention Center, Toronto. Contact: 613-233-4888, ext. 102, or [www.cwta.ca](http://www.cwta.ca).

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## So many people, so few jobs

We've heard it before, and you know first-hand one of the biggest problems facing this industry is the lack of human resources. In the June issue of *MRT*, "Public Safety: '10-2'" columnist David Dunford stressed the need for two-way radio technicians trained in RF. In response to his column, Bruce Bothwell, instructor of electronics at Chemeketa Community College in Oregon, wrote us that the RF industry is facing competition from bigger industry, such as the computer giants.

Hope does exist, however. Another reader let us know

that his college is training RF technicians, and that these graduates are looking for jobs. Santa Ana College in Santa Ana, CA, according to Floyd Martin, electronics department chairman, boasts a comprehensive program in communications. He wrote that students receive more than 40 credits of digital and analog theory as well as training in RF measurement techniques before graduating. Martin can be contacted at email address: [wa6itd@earthlink.net](mailto:wa6itd@earthlink.net) to post your available positions.

Most likely, you are looking for technicians, and another organization is actively working to relieve the problem.

Hats off to GWEC, the Global Wireless Education Consortium in St. Cloud, MN, ([www.gwec.org](http://www.gwec.org)) which is focused on expanding wireless technology curriculum in two-year, four-year, and masters-level academic programs.

Misty Baker, executive director of GWEC, presented GWEC's message at the International Wireless Communications Expo in Las Vegas in March. When she asked how many in the audience were looking for technicians and engineers, everyone in the room raised a hand.

GWEC estimates that 32,000 technical jobs are currently available and that by 2008, there will be 308,000 open positions in the telecommunications area. The employee pool is just not keeping up with the demand in this industry.

Baker said that high school was preparing students for college and college was preparing them for work, but neither was preparing them for jobs in wireless. GWEC is working on that by developing curriculum and adding education and industry partners. Agilent Technologies is the latest to come on board.

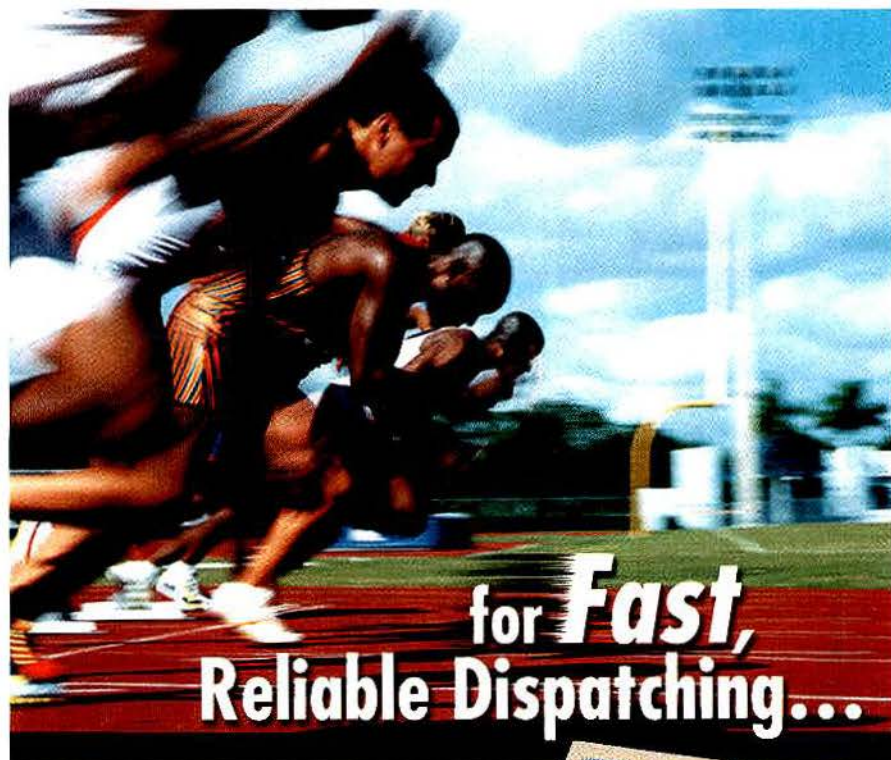
GWEC is also starting to work with K-12 programs, which I would definitely recommend. Many people become interested in, or choose, their careers while in high school. Right now, there are art, architecture, journalism, science, vo-tech and music classes in high schools. Why not telecommunications or engineering? Get the kids interested in what technicians do. Show them the newest radio models. Maybe that way, more people will choose the RF path early, and follow up with the education and training.

—Nikki Chandler

Senior Associate Editor

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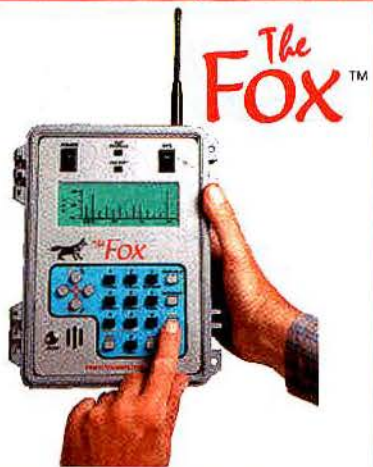
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## Innocent bystanders

By Robert H. Schwaninger Jr.

Ever get between two bullies on the playground? There you are, just standing with the kickball in your hand, and the next thing you know you're the target of two jeering toughguys who have decided that your taffy is going to get pulled.

It's think-and-shrink time. First, decide which one of these frothy foes you might want to side with against the other. It would be nice to be on the winning side. But as is often the case, your side isn't well represented when the fists start flying. More often than not, the bullies just beat the heck out of you rather than one another. So you have to shrink. That is, try to make yourself not worthy of their attention at that moment and hope that they find some other pee-wee to push around. It's the old "look over there" dodge. Sometimes it works, and sometimes they just keep on comin'.

If this situation has ever happened to you, at least you've got some reference point for dealing with the battle going on between PCIA and ITA regarding the coordination of UHF or VHF trunking systems. If the license says "YG" on it, then it's likely that one of the coordinators is going to say that the other coordinator didn't do it right.

Operators all over the country are getting "courtesy" copies of letters being pumped out mainly by ITA, that seek to inform the FCC that YG licenses were granted in error. ITA cites co-channel operations that the rules state must be taken into account for coordination before you

can get an exclusive YG license. According to ITA, PCIA has blown it and caused the commission to grant a slew of licenses in error.

One of my clients got caught in this hair-pulling contest when it went to modify a license that had been on the FCC books for a couple of years. ITA

wasn't going to take any guff from ITA and that the operator shouldn't worry. So, PCIA wrote its own letter.

The PCIA letter said, in essence, "Maybe we didn't coordinate correctly when we relocated, but ITA blew it when it coordinated the original station license." Oh great. Now the client's got ITA challenging the application and PCIA challenging the original station license. So the whole facility is in jeopardy.

As these firefights have increased in number and severity, the FCC has provided zero guidance. To date, none of these incidents has resulted in the FCC taking any action known to us. Instead, mommy has got two kids fighting in the back seat and hasn't decided whether to stop the car.

If you ask the kids, each one will point at the other and whine in sing-song fashion, "He started it" (as though knowing the origin would help). The truth is, the FCC started it when it decided to stick its nose into private trunked systems. Although UHF trunking of private radio channels has gone on for more than a decade, the FCC didn't get involved in the area until it decided to reform the private radio spectrum. Suddenly—and for no good reason—the FCC decided it needed rules for trunking.

Linking trunked operation with channel exclusivity was the next step toward conflict. The FCC decided that if you could show that your facility's contours

wouldn't overlap the contours of a co-channel or adjacent channel facility (situated anywhere within an area roughly the size of the Milky Way), you might qualify for exclusive use.

There was also that issue regarding centralized vs. decentralized trunking. One was a problem and the other wasn't, except that the FCC's definition of these terms read like the instructions for installing a left-handed flange grommet to hang a storm door made in Korea.

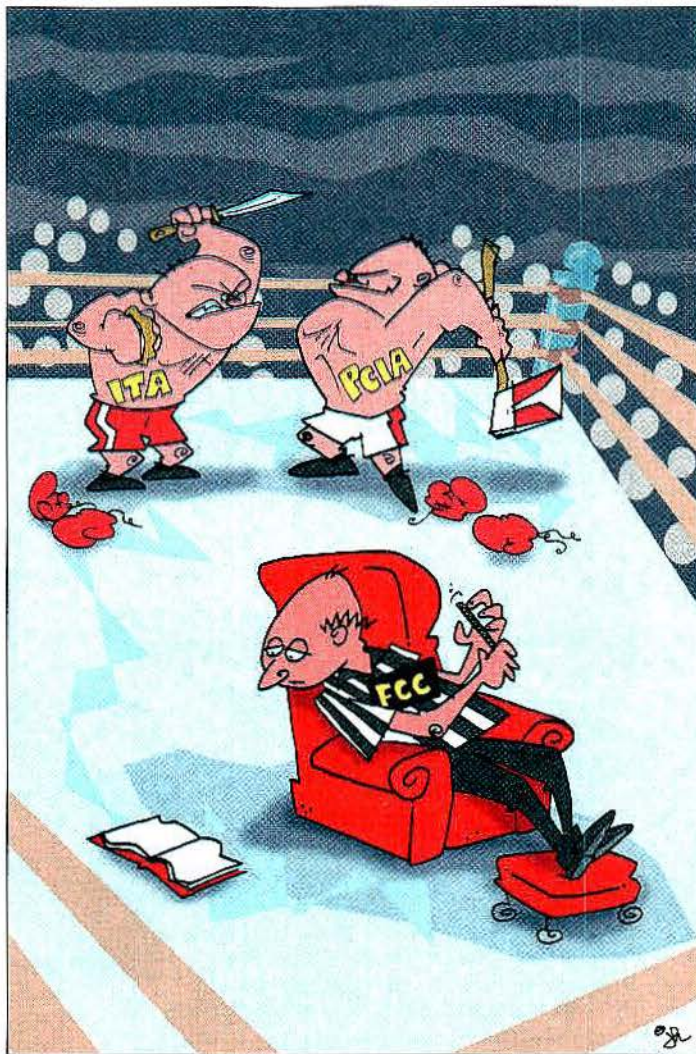


Illustration by John Hayes

wrote the FCC a letter saying that the proposed relocation of the station would result in improper operations and that PCIA's coordination of the application had failed to take into account its duty to check co-channel and adjacent channel users.

Our client then turned to PCIA and said, in effect, "You gonna let ITA talk like that? Are you going to stand up for yourself and support your earlier coordination?" PCIA said that it

Schwaninger, MRT's regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington, which is counsel to Small Business in Telecommunications. Schwaninger is also a member of the Radio Club of America.





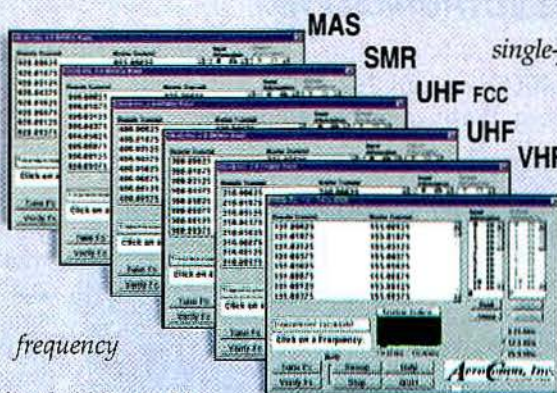
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So what's going to be the outcome of the range wars between PCIA and ITA? Well, first these organizations are going to scare, frustrate and generally tick off a bunch of licensees. Operators who have held licenses for a while, and who have constructed their systems based on their grants, are going to wonder if they blew a bunch of money on equipment they can't use.

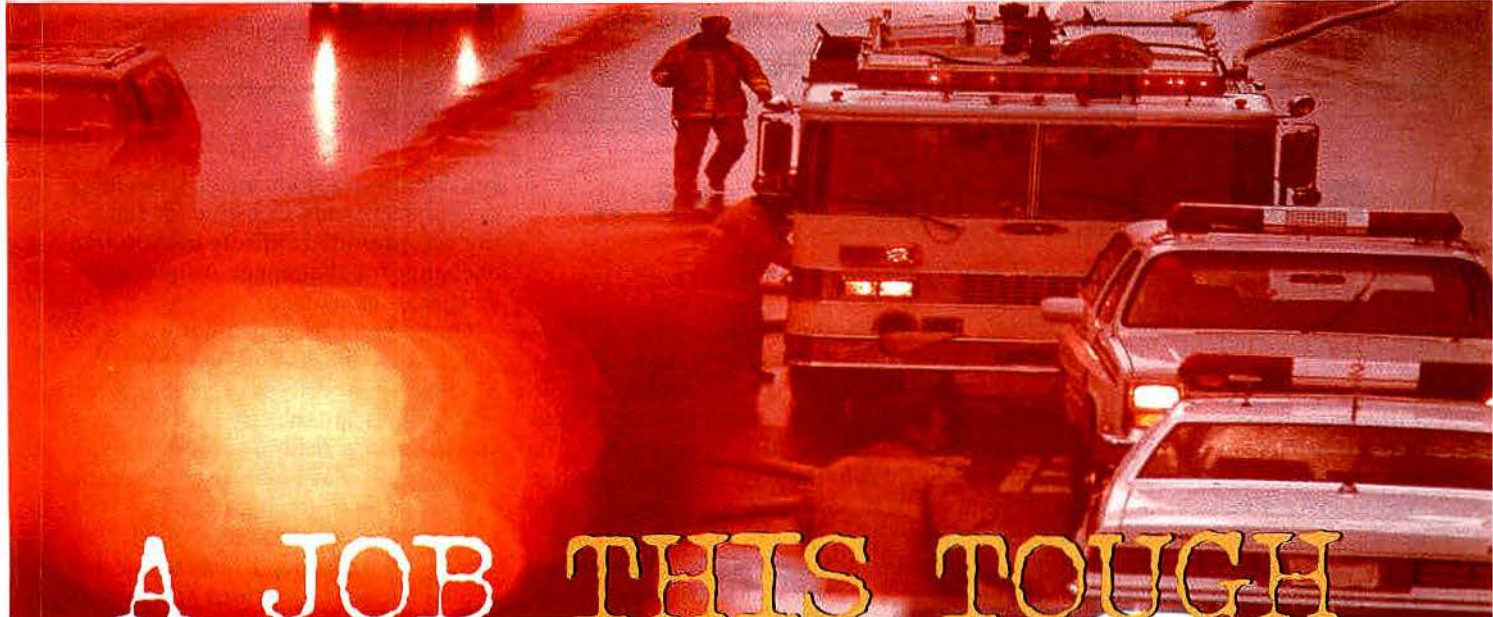
If you are operating a centralized trunking format, you are at the greatest risk. The threshold for licensed operation is higher than for decentralized trunking. If you are using decentralized trunking, and you don't care if you get exclusive use of the channels (i.e. IG operation rather than YG operation), then you are likely under the radar screen of this dogfight. If you hold a YG license, the FCC may modify your grant and change it into an IG license, thereby canceling your exclusivity. And if your license was granted some time ago, the FCC's actions might require a hearing.

In short, it's a bit of a mess, and each situation is a little different from the next. And there is a subplot to this whole controversy. Let's say that PCIA coordinated your application and that, based on its recommendation the FCC granted you a YG license. Based on that grant, you went out and purchased centralized trunking equipment and have built your station. Additionally, you went out and signed up customers who are happily using your system. What if the FCC wants to cancel or substantially modify the license, causing you to do business differently? Who pays?

As with all things, you pay first. The victim always does. But can you seek compensation from PCIA for blowing the coordination? This is an issue that I've batted around the FCC and the courts for years without success. In short, what's the liability arising out of a muffed coordination? A court *could* reasonably find that the coordinator should pay you for messing up the coordination. The fact that no case has gotten that far is not an indication that such a cause of action would be unsuccessful. But who wants the hassle?

And hassle is what this is. So, why do operators have to suffer through this, and why did this whole thing get started? Don't ask me. I've got my theories, but it may just come down to a case of sibling rivalry. So let's send these two to sit in the corner. Trouble is, the corners they are sitting in have turnbuckles.





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## Build a tower into the air ...

... And people will see it from everywhere

By David O. Dunford

If you're in the radio business, you're in the tower business. You may call it wireless, PCS or SMR, but it's all radio. And to make a radio system work, you need a network of sites and towers. (Here's the answer to municipal planners' first question: "No, we *can't* just use one *really tall* tower conveniently located out in the country or in another city.") Everybody, it seems, wants to be in the radio business, and additional sites are essential for the survival of wireless providers. For the "small block" and narrowband providers, like cellular (Remember when cellular was a fat cat?), more sites are needed to accommodate more users through channel reuse. "Big block" providers need more sites to expand service areas and Internet link-ups to keep pace with marketing promises. Private users, such as our small community, need more sites simply to keep pace with city expansion.

Clearly, then, this seems like a simple problem of securing adequate construction financing and educating the local governmental entities about the necessity for (and entitlement of) wireless tower construction. So a new entity, the "site procurement firm," is contracted and sends its "people" to the local planning commission meeting. It's often in this venue that the baking soda meets the vinegar. The site firms feign ignorance of their client's RF system (usually, it's not an act) and deny any empowerment to discuss site alternatives. Often a local, high-powered, red-faced attorney represents the wireless client, which can further disengage local sympathy. In many cases it's become an example of an irresistible force meeting an immovable object.

It doesn't always need to be this bad. In fact, public safety managers are in a unique position to *avoid* these problems altogether. Public safety relies extensively on radio communications and has the same need for tower space as our commercial sector counterparts.

In our own city, realizing the need for additional commercial sites (along with the need for additional city radio sites), several of our staff members met and

discussed the prospect for a city-coordinated tower site development plan. Eventually, we developed a simple plan that was adopted within two months of its initial presentation in 1996. From the city's perspective, our key to success so far has been the inclusion of people from three departments: planning, legal and public safety (where



A brochure to promote city tower sites to commercial providers.

Radioman resides.) Bill Meyer is the bright director of planning and development for Lenexa. He is not only even-tempered and visionary, but practical as well, and his careful guidance helped create a balance between the city's roles as "landlord" and "regulator." Eric Arner is the assistant city attorney who had been handling franchise fees and rights-of-

way access, so he was a natural choice for this project.

The siting guidelines our city adopted are simple and have four components:

1. As practical, we want to minimize the number of towers in the city.
2. Where possible, users should colocate. (Planning requires structures capable of supporting three carriers).
3. Tower siting and construction must comply with established planning guidelines regarding land use, permitting, construction and appearance.
4. As appropriate, we try to leverage the city's financial interests with tower users whenever possible.

Our first public-private partnership based on these guidelines evolved from a request by Aerial Communications to rent space on a city-owned, 180-foot Rohn 55 guyed tower. The existing tower couldn't handle the antenna load, so we discussed the prospects for Aerial to build a suitable monopole at the same site. An agreement was crafted and plans were drawn to construct a five-carrier, 180-foot monopole and to develop a

suitable site to accommodate six shelters or equipment pads. Construction financing was provided entirely by Aerial in exchange for abatement of site rent for an agreed-upon time.

Our second joint project was with Southwestern Bell Wireless (SWBW). SWBW wanted to sever a lease at a nearby site, and the city needed a new site to replace an aging elevated water tank. Again, SWBW provided all the construction financing to erect a 180-foot monopole and to remodel a 1,200-square-foot shelter in exchange for abated site rent. Our third project was also with SWBW and involved building a new tower in a (gasp!) public park. The project started off with SWBW offering to build an expensive silo near a decorative red barn in the park. It evolved into replacing an existing tower at a fire station contiguous to the property.

In all three cases, there has been mutual benefit to both parties in the development agreements. The city now owns three new towers, and the wireless providers have assured their site occupancy for 10 years. Additionally, the process was expedited by public-private cooperation because members of the planning commission were also involved on the "front end." Because the towers were designed and built for future growth and substantial extra capacity, the city now acts as a landlord and rents space to additional wireless users. Currently, the city is realizing annual revenues of nearly \$108,000. Not only is this "windfall" a direct benefit to the taxpayers, but a portion of it has been earmarked for future site-development partnerships and site maintenance. Also, the availability of developed tower sites allows the city to encourage and foster deployment of high-speed wireless Internet access. Again, in this "win-win" scenario, the wireless provider has the city as a venture "partner," and the city has access to high-tech services.

With its own needs—and the city's development interests—in mind, public safety can go a long way toward striking a balance between often adversarial participants who are all striving for the same thing. ■

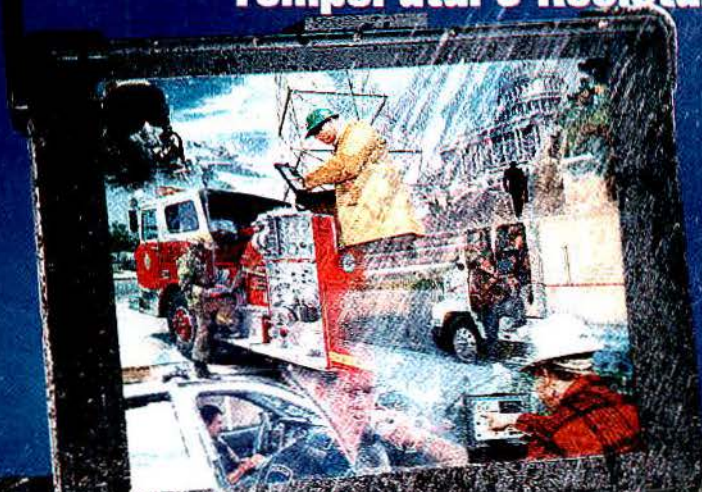
Dunford, MRT's public safety consultant, is manager of technical services for the Lenexa, KS, police department. He is a member of the Radio Club of America and a member and past president of the Kansas Chapter of the Association of Public-Safety Communications Officials—International. You can email Dunford at [mrt@intertec.com](mailto:mrt@intertec.com).



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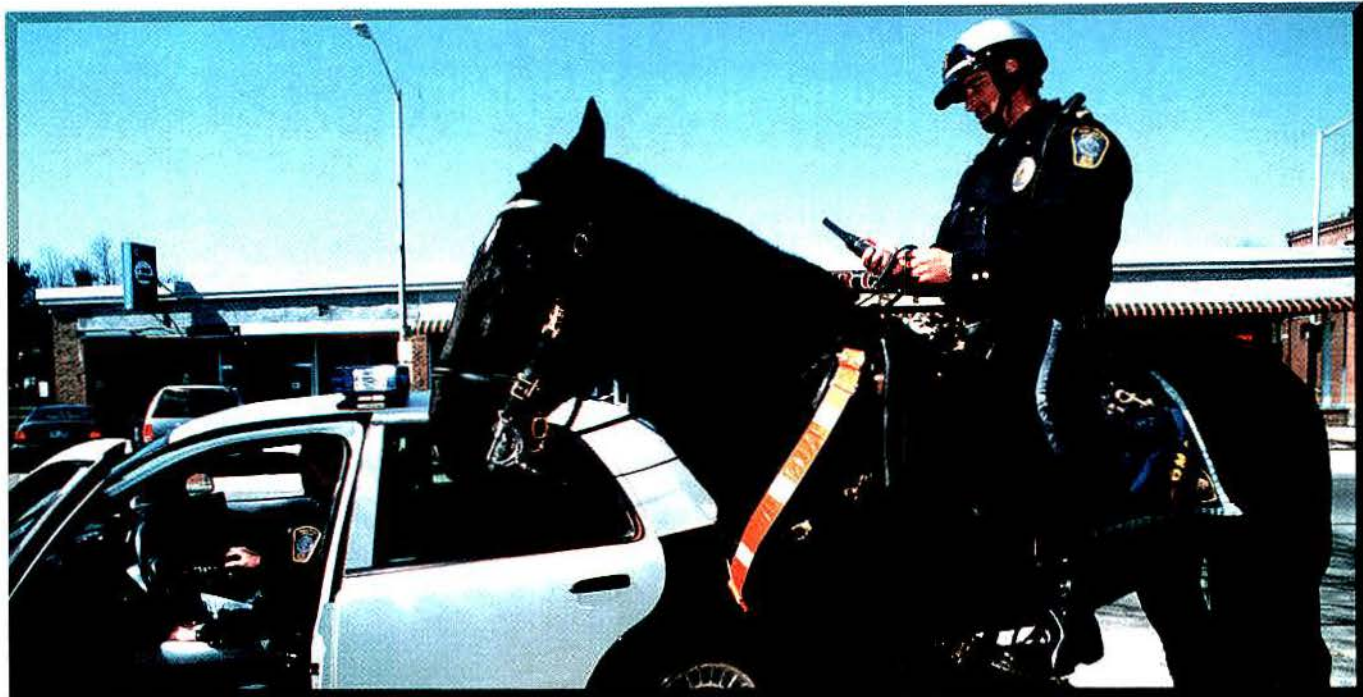
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# Case closed

*Fairfield, NJ, police use wireless mobile data to help solve a robbery and murder case and to increase officer safety and efficiency.*



By Steven Gutkin

Whether their mounts are traditional or modern, Fairfield officers have wireless access to resources.

Recently, an attendant at a Pequannock, NJ, gas station was shot to death after being robbed at gunpoint. Police collected as evidence a security video camera tape of the crime.

Within hours, local police and investigators distributed footage from the tape to neighboring agencies and area television stations, hoping someone would come forward with information. Seventy-two hours after the robbery-murder, Officer Vincent Crapello of the Fairfield, NJ, Police Department (FPD) stopped a suspicious-looking vehicle. He ran a check on the license plate using Packetcluster Patrol, a wireless mobile information system from Marlborough, MA-based Cerulean Technology. Within seconds of entering the license plate number into the system, information flashed onto Crapello's laptop stating that the vehicle was wanted in connection with a missing-person case in Jefferson Township, NJ.

Armed with this information, Crapello approached the vehicle and arrested the man on weapons possession

charges. Later, at headquarters, the suspect confessed to the gas station murder.

"This case could not have been solved as quickly without Packetcluster Patrol," said FPD Chief Edward C. Facas. "Using the system, Officer Crapello was able to access multiple databases to get information regarding the vehicle and the suspect during a routine license plate inquiry—a process that may not have occurred, or might have taken what typically seems like hours, without Packetcluster."

## Officer safety and efficiency

The mobile data system, in addition to its role in this case, helps Fairfield officers uncover outstanding warrants for arrest during routine license and registration checks. These include warrants for auto theft and "deadbeat" parents who owe child support payments.

"With access to various databases at their fingertips, officers have easy and speedy access to critical law enforcement information. Our officers can now perform their jobs more effectively," said Chief Facas. ... "We have seen an

increase in the number of warrant-related arrests and a significant rise in stolen vehicle recoveries."

The software integrates with wireless communications technology to allow more than 100 officers in four New Jersey towns (Fairfield, Caldwell, Essex Fells and Roseland) access to vital criminal and motor vehicle databases from the field. The agencies use a nationwide radio network from BellSouth Wireless Data to link patrol car laptops to the Packetcluster server, which is connected through a router to individual state and national motor vehicle and law enforcement databases. Access to critical information sources, such as the New Jersey Division of Motor Vehicles and the New Jersey state police criminal justice database, provides officers with warrant data, and vehicle and driver registration information. A second router connects field officers with the FBI National Crime Information Center (NCIC) databases, providing instant

Gutkin is a lieutenant with the Fairfield, NJ, police department.



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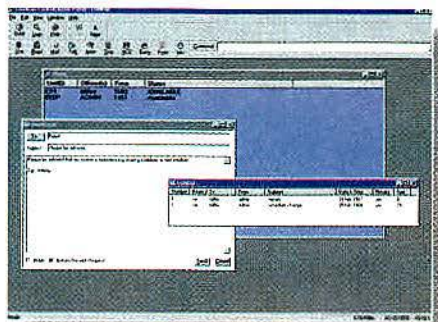
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Mobile data software can include real-time email to watch commanders or other departments, such as vehicle service.

access to criminal history and wanted-felon information.

"Previously, using a radio dispatch system, officers had to wait 10 to 12 minutes for information from the dispatcher located at headquarters," Chief Facas said. "Now, officers know within moments of their query they'll have all the information they need to make an arrest, ensuring their safety in a potentially dangerous situation."

#### More crime-fighting capabilities

Mobile data can make officers safer by providing them with critical law enforcement information before approaching a suspect. To improve officer safety

further, Fairfield will integrate Packet-cluster Patrol with its computer-aided dispatch and in-house records management system, which is connected to an online mugshot database. Instant access to multiple information sources will enable officers to cross-reference previous cases and arrests, access known identification information (such as birthmarks or tattoos) and query recorded crime patterns, including location of recent car thefts.

Fairfield plans to expand its wireless communications by adding Cerulean's Packetwriter wireless report-writing software. Field reporting (writing, filing and updating) keeps officers on active patrol, rather than constantly returning to headquarters to manually process the information.

The security of data communications makes patrol officers more effective, while ensuring their safety. Using mobile data, officers can keep investigative and undercover operations information out of the hands of criminals. In the past, technology-savvy criminals knew when officers were approaching by listening to police scanners. Encrypted communications technology allows officers to share sensitive information over the radio as data, as well as real-



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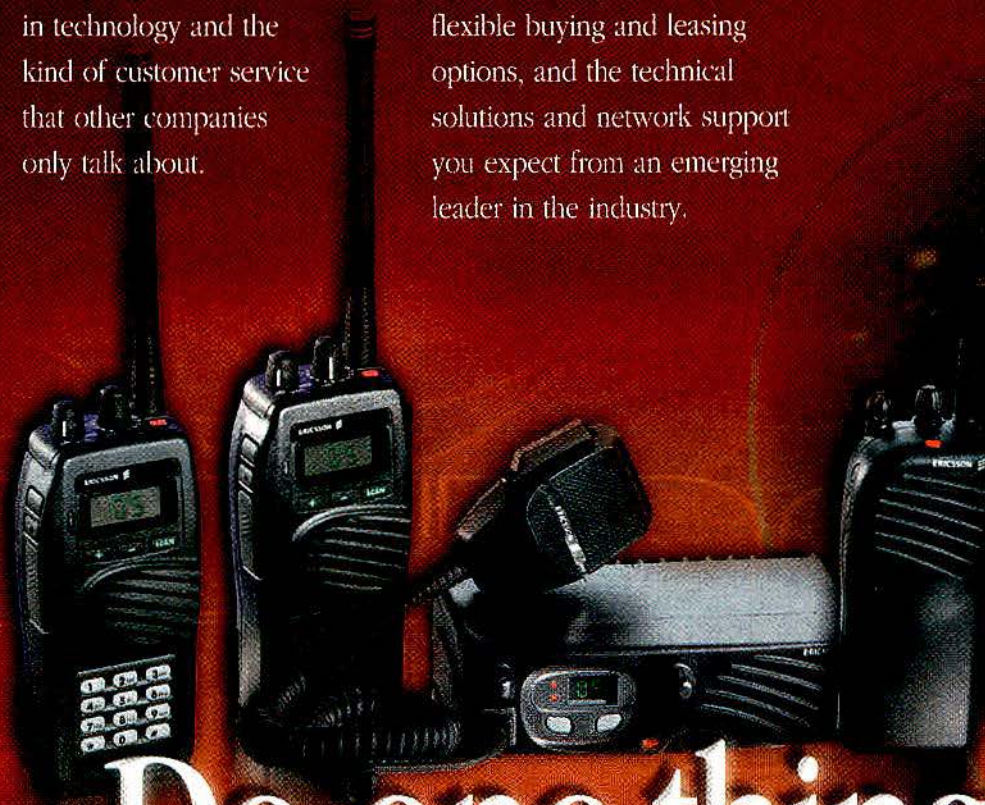


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# You got intermod?

*Hunting the source of a distortion problem can be facilitated with a reliable portable radio and a little homemade artillery.*

By Patrick E. Buller

*Intermodulation*, "intermod" for short, has been around for some time. In fact, it's so well known that most radio users assume it's a normal operating condition. Intermod has, in effect, crippled the two-way radio industry's ability to develop the market much further. A trip to any big city with an average portable radio is one way to tell. There may be some sites in service that are relatively free from this curse, but if you're not one of the lucky ones, the following might be a neat bag of tricks to keep the situation under control. (Radio amateurs may also find this extremely useful for "bunny hunts.")

## A case in point

A severe case of intermod happened "overnight," so to speak, causing interruption to a public safety prime channel. It was determined that this was the classic " $A + B - C = D$ " signal-mixing problem.  $D$ , in this case, is the repeater input, associated with:  $B$ , a 100W VHF GE base station;  $A$ , a 250W continuous-operating VHF transmitter; and  $C$ , another 100W VHF repeater. Each system was on a separate tower. All the systems were on the same mountain and within a 50-foot radius. It just so happens that the interference appeared after station  $A$  came on the air.

It was simply thought that all we had to do was find the single source of the intermod and fix the problem. ("Must be someone's transmitter" or, "It's gotta be in someone's receiver" or "Maybe it's a bad antenna.")

The usual steps were taken, such as investigating who had cavities, duplexers, isolators, sufficient grounding and the like. All the sites were found to have in-service isolators, 10-inch-diameter series cavities and double-shielded coax interconnecting all devices. The antennas and the solid-shield feed lines were verified as acceptable with an Anritsu 113B analyzer. In sum, all parties had the appropriate equipment in service.

Frustration began when a VHF

hand-held portable radio was used for the receiver and loop antenna for determining direction. With all transmitters in line, it was (as you might guess) impossible to get a null. RF was getting into the radio, so another approach was needed: *radio shielding*. (By the way, wrapping the radio in tin foil is a poor approach, at best.)

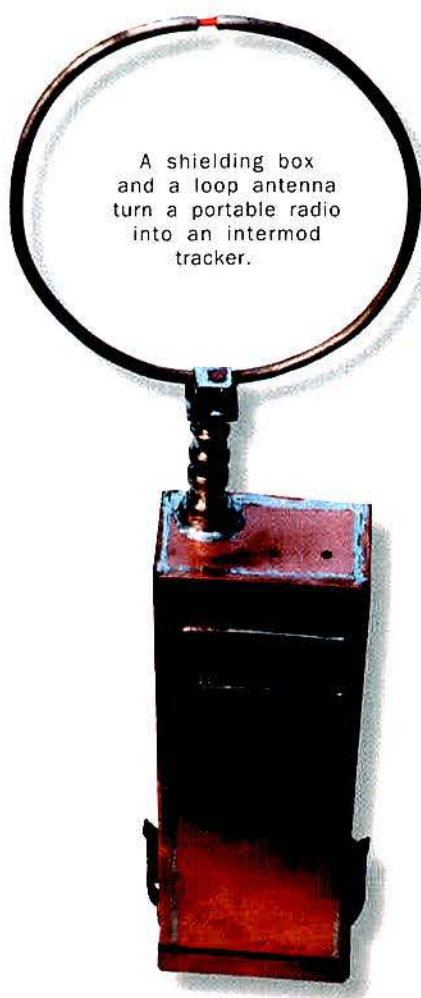


Figure 1 on page 23 shows a shielding box that was fabricated (from double-sided printed circuit board material) specifically to house a Kenwood hand-held. With the antenna port terminated, the box provides a measured 130dB of shielding—far superior to tin foil.

Fabrication is done by completely

soldering the inside joints of all sides and corners. The outside box corners were also soldered with a strip of copper foil to complete the outside electrical connections. The box opening has foil wrapped around the edges to connect the inside foil to the outside foil, as shown in Figure 2 on page 23. The cover is made from sheet copper, and inside the cover is a copper braid around the perimeter that makes the connection from the box to the cover. (The braid is taken from a small piece of coax cable.) The coax connection at the top is a BNC female to male N adapter, with the threaded shell removed, that is soldered to the top plate. The male N side of this connector mates with the Kenwood portable's antenna connector when the radio is inserted in the box. The top plate also has two small holes drilled immediately above the squelch and volume control knobs. These holes allow the insertion of a small probe to rotate the knobs, if necessary. A few holes are needed for the speaker. (See Figure 3 on page 23.) Keep in mind that fewer holes means better shielding. For the Kenwood's LCD, an opening is cut to the same size and covered with bronze screen. The sharp edges of the screen are framed by soldering them to an 18-gauge wire.

The four-inch-diameter loop antenna shown in Figure 4 on page 23 was constructed from 1/8-inch copper tubing. Female connectors were used with the loop antennas to allow a double BNC male connector to serve as a rotating joint. It's best to hold the radio in an attitude that allows you to see the signal-strength meter while rotating the loop.

The small coax loop uses RG 59/U that is for the magnetic field. The small probe favors the E field. The loop antenna performs like any other loop (i.e., a null appears broadside to the plane of the loop). It's the null that indicates the

Contributing Editor Buller is an electronics design engineer for the Washington State Patrol, Bellevue, WA. He is a member of IEEE, NARTE, APCO and ARRL and a Fellow of the Radio Club of America. His email address is [W7rqt@msn.com](mailto:W7rqt@msn.com).



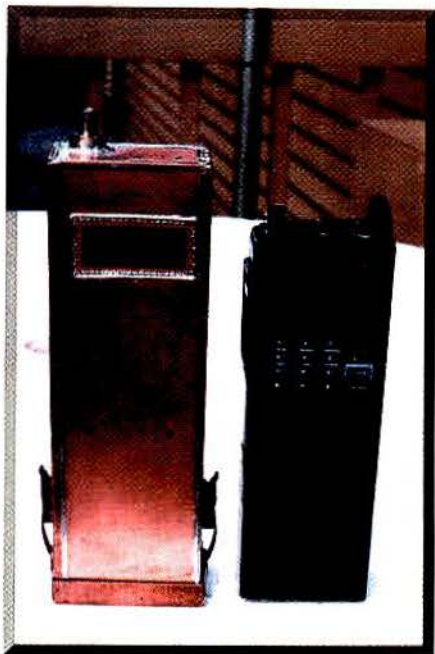


Figure 1. Shield box and Kenwood portable.

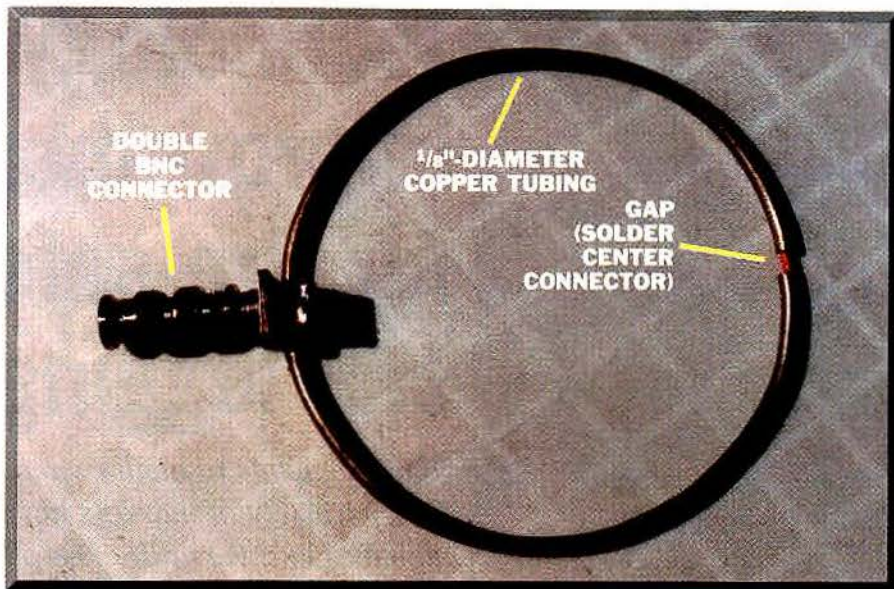


Figure 4. Four-inch-diameter loop with BNC-BNC connector as a rotating joint.

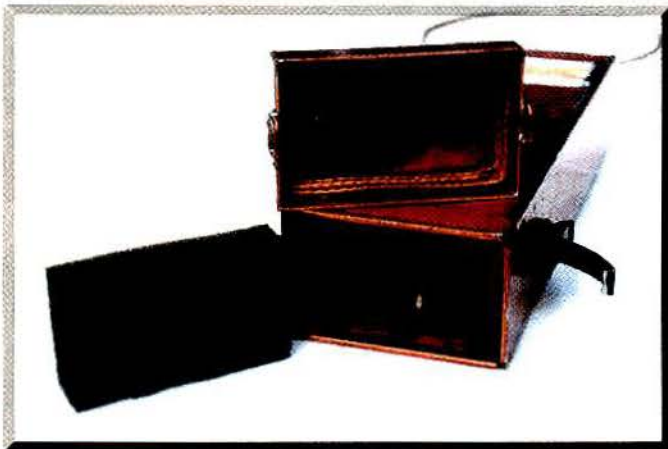


Figure 2. Bottom view, showing shield, RF gasket and sponge support.

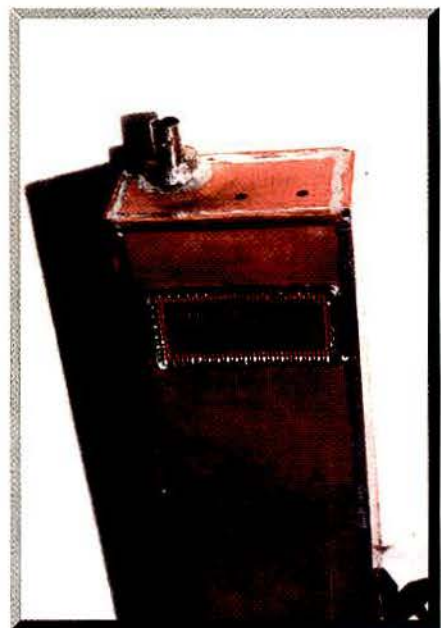


Figure 3. BNC connector on top plate with volume and squelch access holes.

direction of the signal. Our site test proved the shielding to be acceptable, and the loop antennas were sufficient to indicate the origin of the offending signal.

#### Going hunting

The loop antenna indicated where the strongest RF hot spots on the tower(s) were. The small

probes were then used to pinpoint the exact cause. The problem soon became apparent—the enemy was *everywhere*. Intermod sources included tower bolts, loose tower grounding, chain link fence (30 years old) topped with rusty barbed wire, signs wire-wrapped to the fence matting and, finally, an unauthorized, low-budget repeater without cavities, isolators or equipment grounding.

A simple “homemade” shielded box proved to be a valuable accessory to trace and verify the intermod “culprit(s).” The four tenants have sentenced themselves to an overall cleanup. There was no one “guilty” party. It was more a case of “guilt by association.” ■

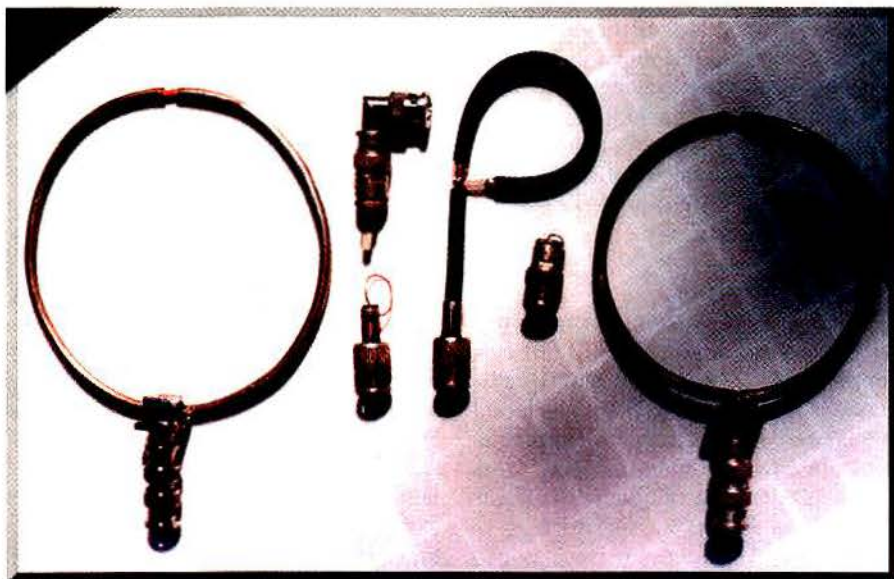


Figure 5. Antenna assortment.



# Technology improvements for fire-safety call logging

*Improvements in media's retrieval speed, remote access and a variety of markers have made call logging more efficient and versatile. The platform, training and vendor reliability remain crucial to implementing a system.*



By Steve Arcoleo

Call logging systems remain a staple of any modern fire department. However, the basic applications for recording have expanded well beyond radio transmissions and telephone calls. Over the last several years, savings in technological costs have enabled manufacturers of call logging systems to offer busy departments faster access to calls, more flexible search criteria and remote access to information.

## Retrieval of calls

Speed of access to information has always been an important aspect of logging systems in the public safety environment, and today's systems respond to this need better than ever before. Systems are now available that give users access to thousands of hours of calls instantly from their PCs' hard drives.

Playback from archive drives has also improved through the use of Magneto Optical and DVD disk archive drives. These drives provide near-instant access to calls and are replacing DAT tape-

based technology as the media of choice in fire-safety applications. Some units allow playback of recorded calls via any touch-tone phone, thereby giving busy battalion chiefs access to important information from any location.

Versatile search criteria make access to information easier and faster than ever before. Systems today offer time, date, channel, call duration, call direction, DTMF, caller ID and call comments as possible search criteria. More sophisticated systems provide CTI upgrades that include ANI (automatic number identification), trunked radio ID and trunked radio talk groups as additional criteria.

## New call-logging features

Today, fire departments can also use their master time-clock device to drive the recorders' time code information, thus ensuring accurate time and date stamping for faster and more accurate call retrievals.

Moreover, the ability to synchronize the department's recorder with its CAD system, PBX equipment and radio system eliminates discrepancies regarding response time.

To duplicate recorded incidents onto cassettes for court appearances, logging manufacturers now offer a stand-alone PC with a media drive and system software installed to serve as a replay station. Busy departments can then review calls and duplicate them without using the recording device, interrupting one of the media drives or ejecting the current disk and replacing it with the disk they would like to review.

Digital telephone tap cards that elimi-

nate the need for recorder patches or digital-to-analog converters are now available for use with digital PBXs. This technological advance eliminates the need for costly third-party devices that frequently cause failures in the recording process.

## Instant-recall terminals

For fire departments in need of instant recall terminals, logging systems can now run a software application on a dispatcher's PC that uses the hard drive of the logging recorder as an instant recall system. More advanced systems allow an unlimited number of PCs access to the logger with as many as 15 users replaying calls simultaneously. For applications requiring both call-logging and instant-recall terminals, both are available via the LAN.

There are several advantages to using call logging combined with instant recall. An integrated system allows the fire department to leverage its existing infrastructure (LAN, wiring, and PCs) to eliminate the need for stand-alone instant recall terminals, saving money and increasing versatility. Applications running on a PC reduce ongoing maintenance costs and save valuable desk or console space. In addition, because you are using the hard drive of the recorder as your instant recall system, the recording time is not limited as it is with more traditional instant recall systems.

Arcoleo is vice president of business development for ASC Telecom, New York.



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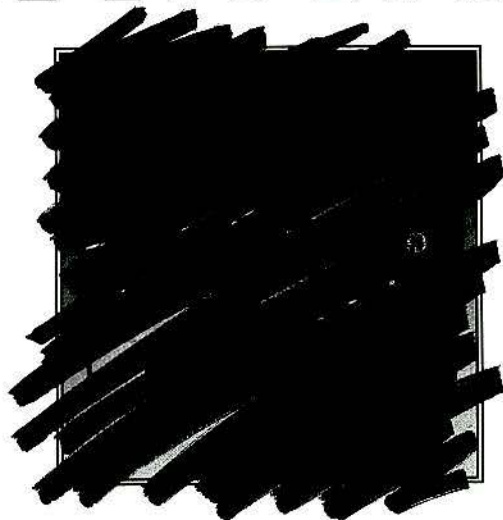
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## Recording platforms

Fire departments must also select the type of recording platform they prefer to use. Either they can select a dedicated recorder platform, or they

can use an industrial-grade PC as the recorder platform. Different advantages

are inherent with each design.

It has been claimed that a PC platform gives access to industry standard components and therefore offers a lower product price combined with the latest in voice technology design. Unfortunately, the facts do not support this statement. All logging manufacturers specify the components to be used when designing their units. The manufacturer then writes its operating system software to work with those components. Therefore, if your unit or components were designed to work

with a certain-size hard drive, you cannot expand it to increase storage capacity without rewriting the software.

For fire-dispatch applications, dedicated recorder designs are the best choice. Most dedicated recorder designs offer front-panel control for stand-alone record and playback functionality and include a built-in backup should PC access be compromised.

## Operating systems

A fire department can also choose a recorder's operating system from among DOS, OS-2, Windows NT and Unix. Though an operating system is transparent to the user (they all use a graphical-user interface in Windows '95, '98 or NT), OS-2 still offers the most reliable multi-tasking available for voice recording.

NT is not suitable for mission-critical recording applications like fire safety because it sometimes locks up the device it is running on without indicating any problem. In a public-safety application, any gap in call documentation could have grave consequences. DOS-based systems offer the user a stable platform but have some limitations with regard to multitasking that affect recorder performance and available features.

## Performance evaluation

Some logging companies now offer software programs that work in conjunction with the recorder to improve the performance of dispatchers. These programs can be customized to establish department objectives, benchmark performance, monitor performance, assist in employee training and document results. The evaluation software is integrated with the recorder allowing simultaneous review and scoring of dispatcher calls. When the supervisor has completed the evaluation, the results of the scoring session, along with the call, are saved or emailed to others in the department for review.

## Choices

Of course, consideration must always be given to the product's track record for reliability, ease of use and product design as well as the financial stability of the manufacturer before deciding on a program. In today's call logging market, there are more communications recording vendors to choose from than ever before, so deciding whom to buy from is becoming as important as what to buy. ■

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## Special signal-tracing probes

By Harold Kinley

Special probes are often needed in land mobile radio servicing for signal tracing in radio transmitters and receivers. The main problem to overcome is the loading effect many probes cause in high-impedance circuits. Certain probes can be used with instrumentation to minimize these loading errors when you are signal tracing.

### Circuit loading

Resistive and capacitive effects can cause circuit loading when a test probe is applied to a circuit. Generally, the impedance of the probe should be at least 10 times the impedance of the circuit under test. The stray probe capacitance should be a small percentage of the capacitance of the circuit under test.

In Figure 1 below, the circuit to the right of the test point is an RLC-tuned circuit. For example, suppose that the impedance of the tuned circuit is  $500\Omega$ . Suppose that: (1) a *direct* probe were to be touched to the test point (TP1), (2) the input to the instrument (spectrum analyzer) is  $50\Omega$  and (3) the shunt capacitance of the probe is 50% of the capacitance of the tuned circuit under test. Obviously, the loading effect of the probe would be severe, and useful measurements would be impossible.

By using an isolation probe such as shown in Figure 1, the loading effect of the probe can be reduced. Suppose the isolation resistor ( $R_P$ ) is  $450\Omega$  and the

instrument impedance ( $R_i$ ) is  $50\Omega$ . This would represent a probe impedance of  $500\Omega$  as seen by the circuit under test. If the impedance of the circuit under test were  $500\Omega$ , the  $500\Omega$  probe would load the circuit such that the measurement would be useless. In some cases, the circuit under test might even cease to function. If the resistance is placed near the probe tip, it will have the added benefit of reducing the probe's stray capacitance as seen by the circuit under test. Because this forms a simple 10:1 voltage divider network, the voltage appearing across the input to the instrument will be 10% of the actual voltage at the probe tip. This represents a 20dB isolation, and the instrument should have enough reserve sensitivity to overcome the probe loss. Otherwise, the probe will be of little value.

Similarly, a 100:1 voltage divider could be used to provide even more isolation. This would require a  $4,950\Omega$  isolating resistor, making the probe  $5,000\Omega$  impedance (as seen by the circuit under test). This would provide an isolation of 40dB—barely meeting the 10:1 rule of thumb when connected across the  $500\Omega$  impedance of the circuit previously discussed. The spectrum analyzer or other instrument would have to have high sensitivity to overcome the loss of such a probe.

The previous discussion pertained to *resistive* loading. The other part of the problem is *capacitive* loading. Because capacitive reactance is frequency-dependent, the probe input impedance



Photo 1. The Ramsey Electronics model PP-1 preamplified probe.

will drop as the frequency increases. Thus, the loading effect increases dramatically as the frequency increases.

### Active probes

One way to reduce probe loading is to place an amplifier in the probe near the tip. The amplifier would have high input impedance—and an output impedance to match the input impedance of the instrument with which it is used. Low-power, high-impedance FET devices are usually used for such applications. Power to the preamplifier is supplied from the instrument—or externally for generic devices. Many spectrum analyzer manufacturers provide special connections, designed specifically for their instruments, for powering an active probe.

Photo 1 above shows an instrument that can be used in conjunction with a spectrum analyzer to signal trace or to examine signals in high-impedance circuits. This particular device is the preamplified probe, model PP-1, made by Ramsey Electronics of Victor, NY. Figure 2 on page 30 is a block diagram of a typical use for the active probe. Although Figure 2 shows the probe used with a spectrum analyzer, it can be used with a frequency counter, oscilloscope or other instrumentation as well. The specifications are listed in Table 1 at the top of page 30.

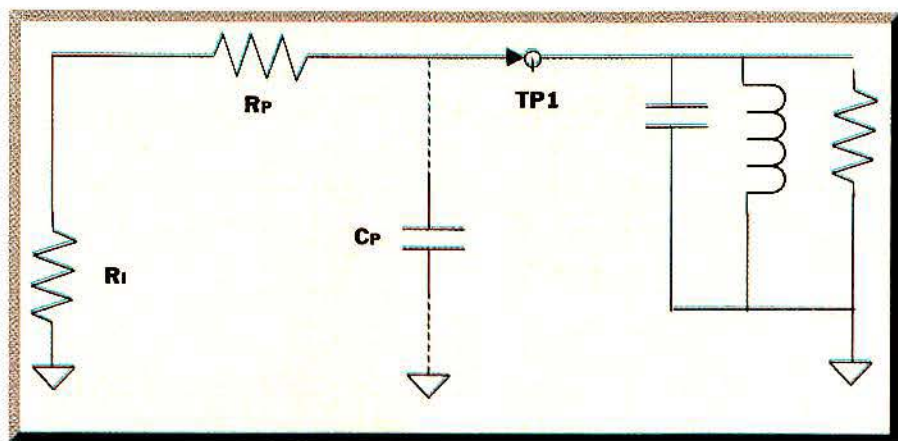


Figure 1. The circuit to the right of the test point represents a tuned circuit consisting of an inductor, a capacitor and a shunt resistor. To the left of the test point,  $C_P$  represents shunt capacitance in the test probe,  $R_P$  represents the series isolation resistor in the test probe and  $R_i$  represents the input impedance of the test instrument.

Contributing Editor Kinley, MRT's technical consultant and a certified electronics technician, is regional communications manager, South Carolina Forestry Commission, Spartanburg, SC. He is the author of *Standard Radio Communications Manual, with Instrumentation and Testing Techniques*, which is available for direct purchase. Write to 204 Tanglewyld Drive, Spartanburg, SC 29301.

Kinley's email address is [hkinley@home.com](mailto:hkinley@home.com).



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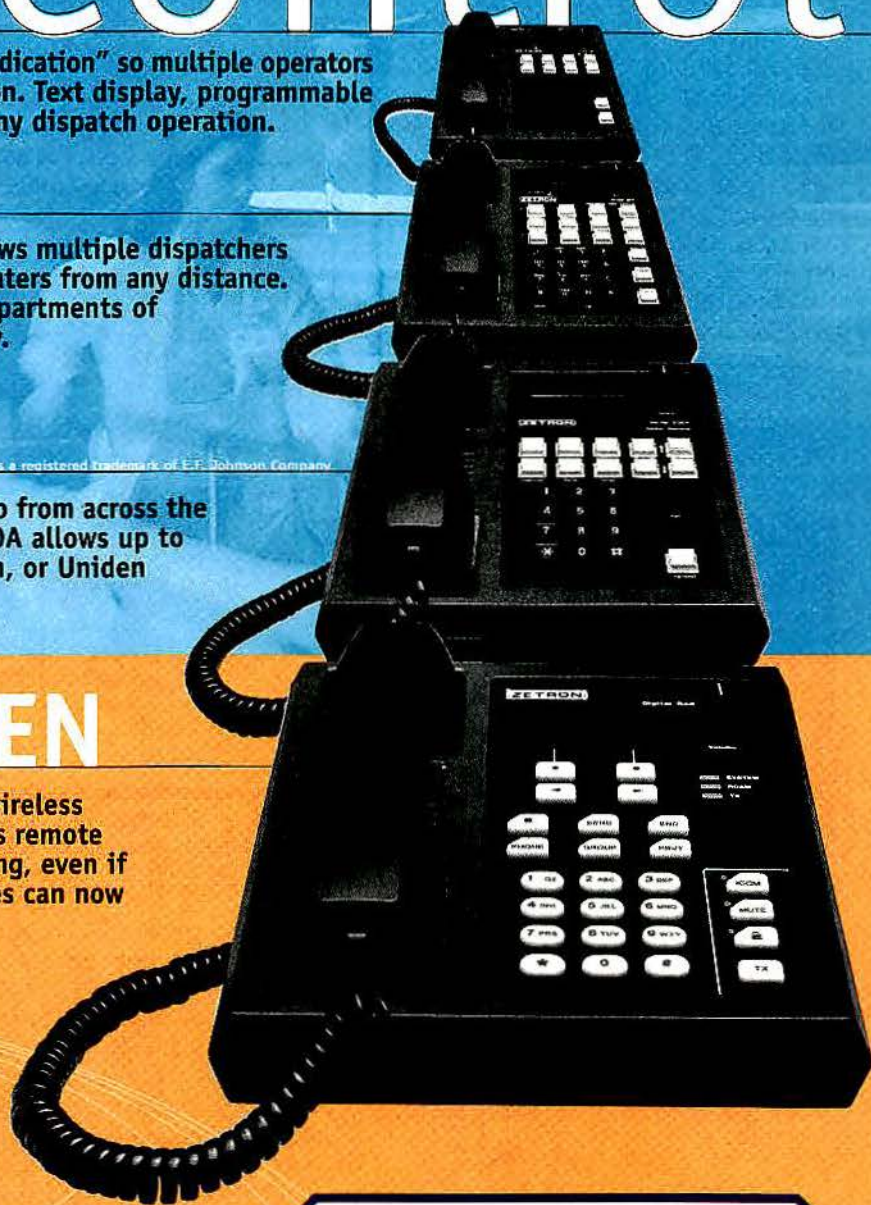
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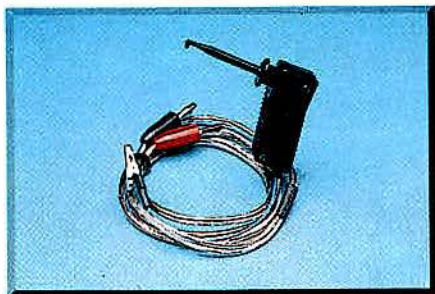


Photo 2. The Ramsey Electronics model RF-1 detector probe.

### Grounding hints

The PP-1 preamplifier probe comes with various probe attachments: two grounding adapters—a gold wire spring clip and a clip-on alligator clip, plus a BNC probe tip adapter. The following information is from the instruction manual for the PP-1 probe.

When probing on a PC board, use the gold spring clip. At higher frequencies, it is important to keep the probe's ground connection short. Errors will be introduced by a long ground wire draping over the circuit board under test. The best technique is to touch the probe tip to the desired measuring point while simultaneously touching the ground spring wire to a

Table 1. Ramsey Electronics PP-1 preamplifier probe specifications.

Useful frequency range:	150kHz to 500MHz
Input impedance:	about 1M $\Omega$
Output impedance:	50 $\Omega$
Power requirements:	12Vac/dc–15Vac/dc
Dc current drain:	<100mA
Maximum input voltage:	1Vac, 30Vdc
Gain:	>15dB from 450kHz to 150MHz
1dB compression point:	+5dBm

### Product notes

- ☐ High gain (as much as 20dB) and usable bandwidth from 150kHz to more than 500MHz. No need for separate preamplifiers to cover different ranges.
- ☐ High-impedance amplifier doesn't load sensitive circuitry found in oscillators, voltage-controlled-oscillators and IF amplifiers.
- ☐ Use of surface-mount FET and MMIC technology right down in the tip of the probe ensures virtually no loading to the circuit.
- ☐ Ideal for measurements on seemingly impossible circuits such as pagers, cellular phones and other wireless products.
- ☐ RF-style probe with fine-pointed tip, spring ground clip, safety ground clip and more than four feet of shielded cable.
- ☐ Includes ac wall adapter, power supply interface with LED indicator and complete operating instructions.


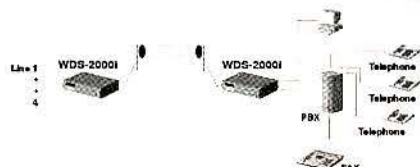
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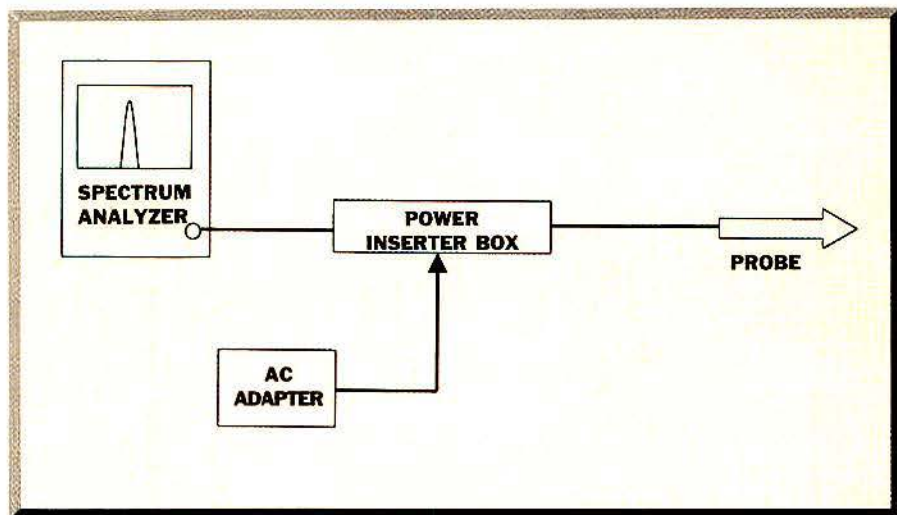


Figure 2. The preamplified probe model PP-1 from Ramsey Electronics can be used with a spectrum analyzer, as shown, to boost the sensitivity and to reduce the loading effect to circuits under test. The probe can also be used with a frequency counter or oscilloscope.

nearby ground point. This technique provides a short path to ground, but it does require some manual dexterity.

Low-frequency measurements allow the use of the standard alligator clip ground. Simply slip the alligator clip wire on the probe body and clip the alligator to a convenient ground point. Above about 10MHz, the gold spring clip ground should be used for best results.

You can even use your body as a ground when measuring some high-frequency signals. Simply hold your finger firmly against the metal ground sleeve near the probe tip. Sometimes this technique works well when measuring frequencies in the 50MHz–150MHz range.

Ramsey Electronics also makes a special RF detector probe (model RF-1), which it calls the "Sniff-it." It is very broadband (100kHz to over 1GHz) and can be used to measure low-level signals in conjunction with any multimeter. The probe uses microwave low-barrier Schottky diodes to provide a sensitive detector reaching 1GHz with a logarithmic output. See Photo 2 above.

The current price of the preamplified probe (PP-1), fully wired and tested, is \$195.95. The price of the model RF-1 "Sniff-it" detector probe is \$22.95, wired and tested. Contact Ramsey Electronics, 793 Canning Parkway, Victor, NY 14564; 716-924-4560. Web site: [www.ramseyelectronics.com](http://www.ramseyelectronics.com).

Until next time—stay tuned!



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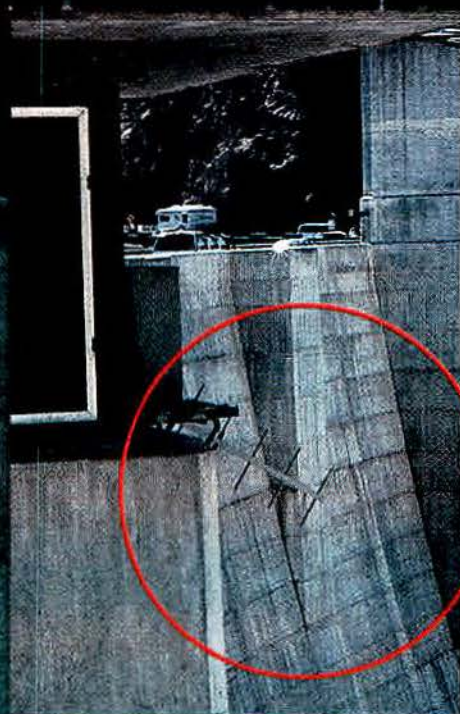
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# LMR USE AT HOOVER DAM

Operating and maintaining hydroelectric production and flood control at one of the world's largest man-made impoundments requires coordination by radio, but wireless in a utility environment has a unique set of noise problems.



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Hoover Dam is arguably one of the best examples of a "wonder of modern engineering." Built during the Depression years and engineered with a slide rule, this structure still serves the American West today, some 65-plus years after its construction. What you may not know is that this one dam is one of the largest generators of hydropower in the world, producing 4 billion kWhr each year. Hoover Dam is also the control center for a vast electrical and water transport system—all connected by radio. If use of radio equipment in an industrial area is problematic, how much more difficult is it in this huge power plant?

While in Las Vegas for IWCE I was able to tour the parts of the dam the public is not allowed to see as part of a tour arranged through the offices of the Bureau of Reclamation. My guide for the tour was Richard Eaker who graciously took time out of a busy day to show me the communications infrastructure of not just Hoover Dam, but of the entire water and power complex controlled from the dam.

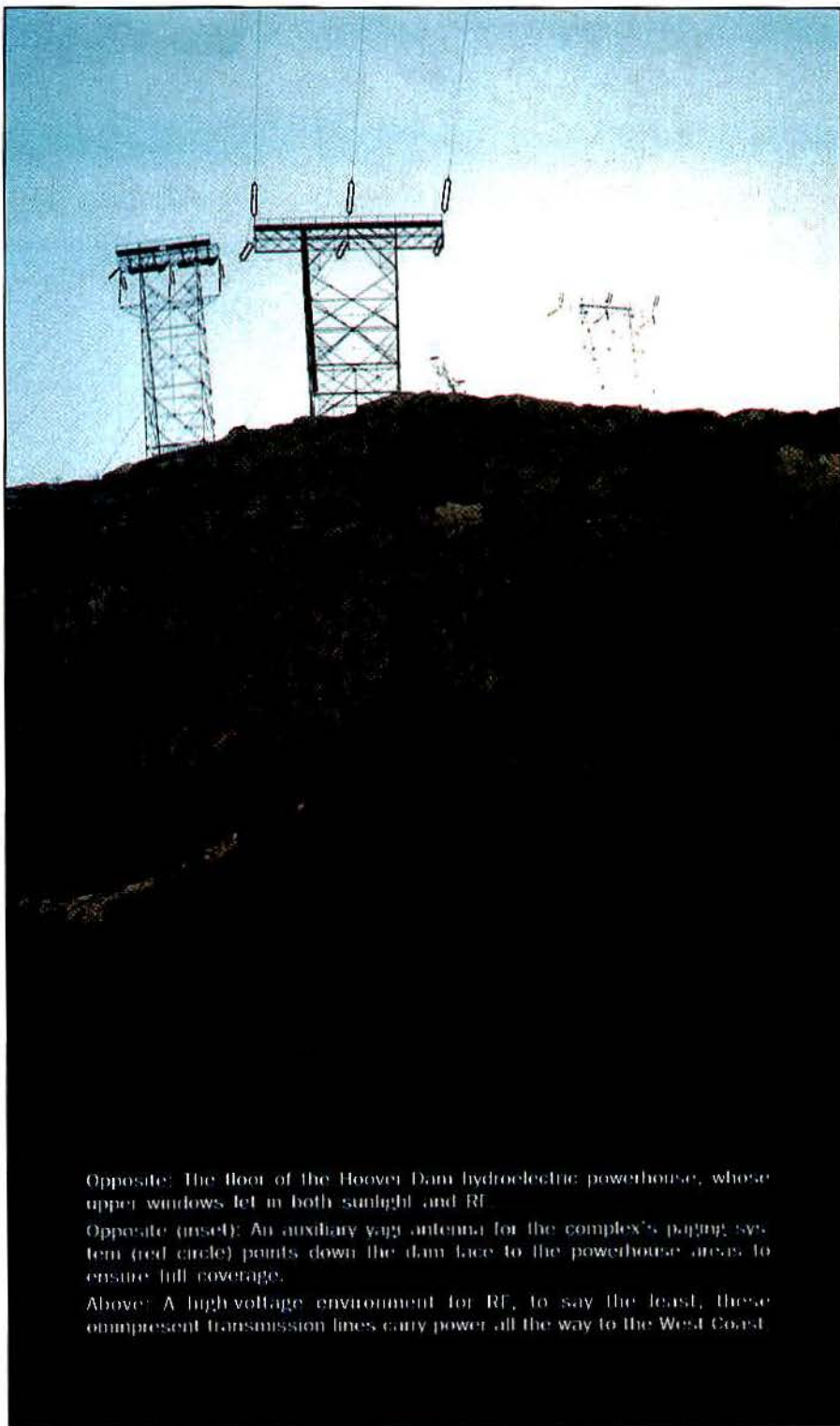
The dam itself is massive: 726 feet tall, 160 feet thick at the base with 10-foot thick powerhouse walls. Hoover Dam is part of a larger complex comprising Hoover Dam; Davis Dam and Parker Dam; Lakes Mead, Mojave and Havasu; river level controls and diversion projects that feed water to Nevada, Arizona and California.

Water is released as needed to meet downstream demands for irrigation or domestic water, or when the dam is being operated under flood control criteria. Irrigation water is provided to numerous projects in the lower Colorado River Basin, including: the Imperial Valley Irrigation District and the Coachella Valley Water District (through the All-American Canal system); the Gila, Yuma, Yuma Auxiliary Projects; the Palo Verde project near Blythe, CA; the Colorado River Indian Reservation; and the Central Arizona Project. The water for southern California is diverted at Lake Havasu and transported through the Metropolitan Water

Contributing Editor Koehler has more than 30 years of experience in radio, telephony and computer electronics. He has been teaching part time at the University of Alaska, Anchorage for the past four years. His email address is AFDEK1@uaa.alaska.edu.

The author thanks Richard Eaker and the staff of Hoover Dam for their assistance and patience in explaining this marvelous structure and the work they do each day.

Photos used courtesy of and copyright by Tec Images Alaska.



Opposite: The floor of the Hoover Dam hydroelectric powerhouse, whose upper windows let in both sunlight and RF.

Opposite (inset): An auxiliary yagi antenna for the complex's paging system (red circle) points down the dam face to the powerhouse areas to ensure full coverage.

Above: A high-voltage environment for RF, to say the least, these omnipresent transmission lines carry power all the way to the West Coast.

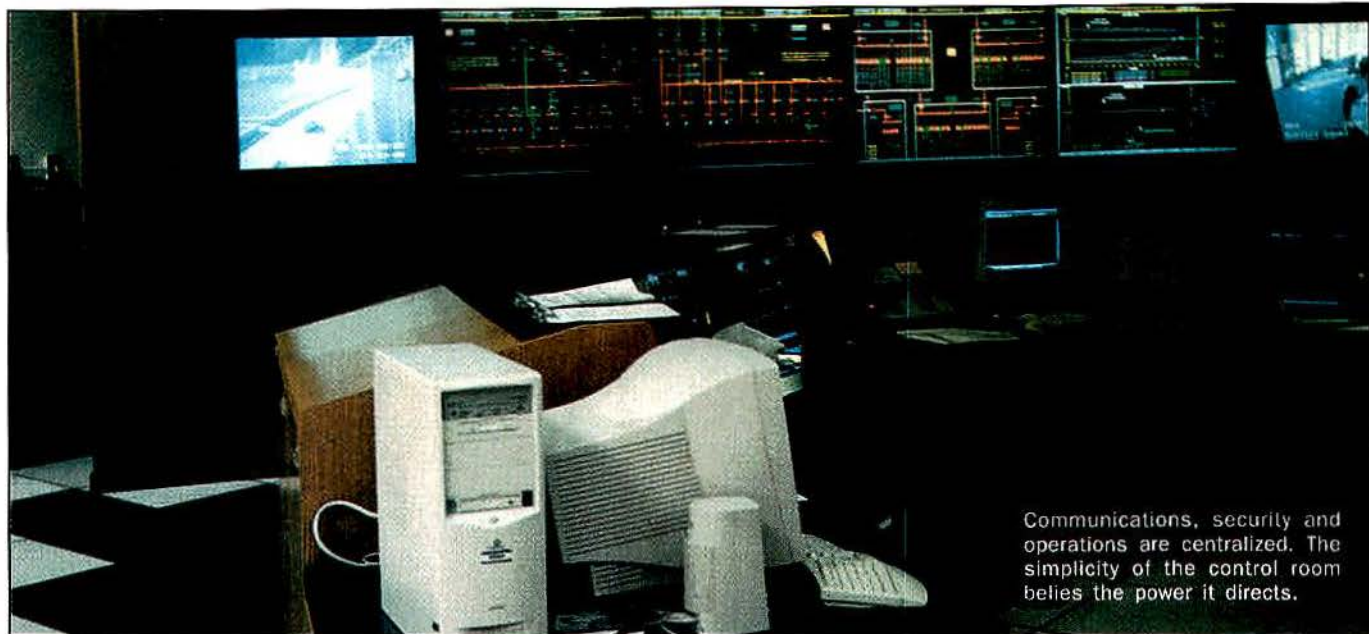
District's Colorado River Aqueduct to the district's area of use. The water for Arizona is also diverted from Lake Havasu, by the Central Arizona Project aqueduct that carries the water as far as Tucson. Southern Nevada withdraws its water from Lake Mead through the Robert B. Griffith (formerly Southern Nevada Water) Project—which can be seen from the road if you tour the shoreline.

Water levels, flow rates and metering are controlled from Hoover Dam, which has remote sensors covering this vast

complex. SCADA data into and out of the complex is carried by a combination of SONET-based communications links and microwave radio between the dams and canals listed above. Local communications is via ordinary LMR radios operated on government VHF/UHF frequencies. A paging system completes the package for the Hoover Dam area.

The dam complex recently installed APCO 25-compliant digital radios for its security forces. Because the dam is a federal facility, security is tight. The





Communications, security and operations are centralized. The simplicity of the control room belies the power it directs.

digital radios have given good service to date and experience no problems with interference from the density of high-voltage/high-power transmission lines found in the dam complex. Other security systems are in use, providing impressive safety for the complex.

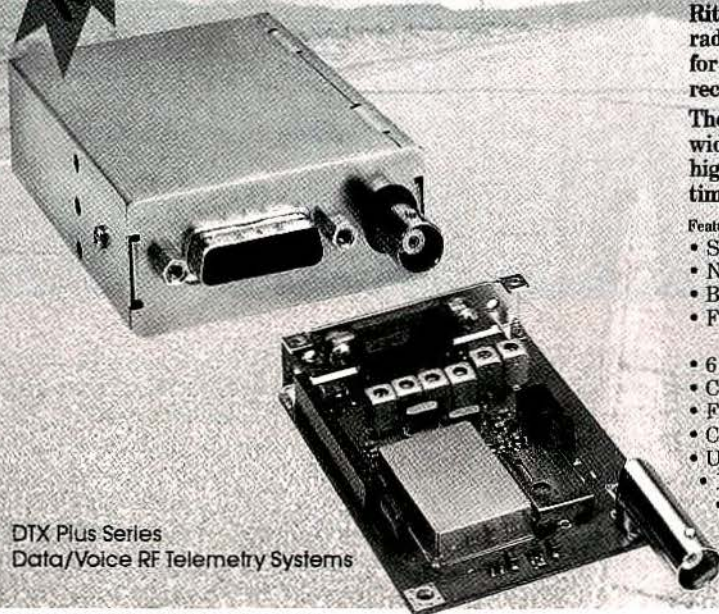
LMR radios are used both inside and outside of the dam itself. Day-to-day maintenance activities are coordinated

via the radio system. Both hand-helds and mobiles are part of the total communications "web" used to support the work of producing electricity. Eaker said that the newer radios are good at rejecting interference from high-power transmission lines.

I asked if any in-band or low-power industrial repeaters were in use for the interior of the dam complex, and I was

surprised to learn that radio coverage for the complex requires no additional repeaters. Workers who go deep into gallery tunnels or dam inspection tunnels check in via wired telephone. Workers in the powerhouse use hand-held radios to stay in touch. I admit I was puzzled, until the large open window area was pointed out, as well as the fact that the dam is only about 1,000 feet in any

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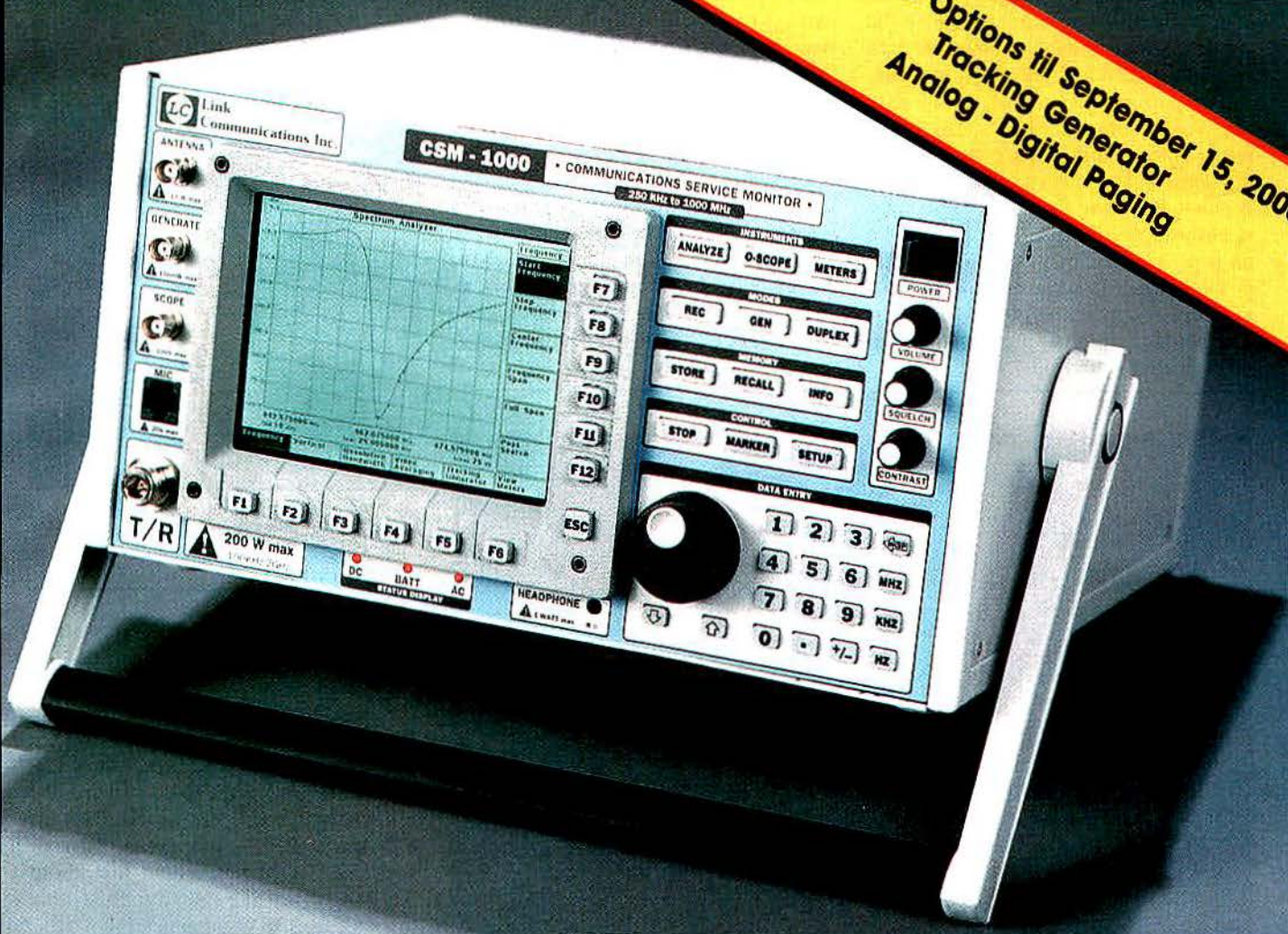
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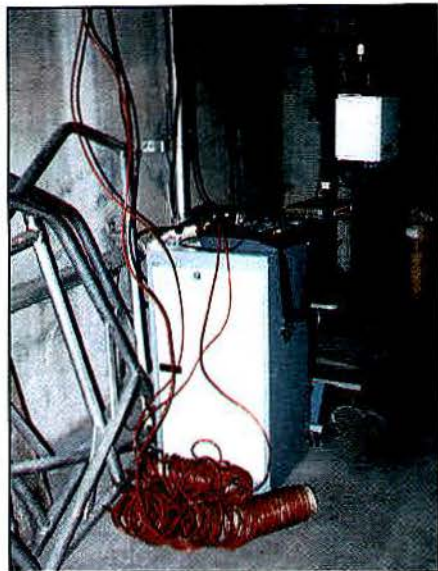
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direction. Outside workers have no communications problems because the signal is strong enough to cover the area around the dam and the outlying areas.

The paging system for the facility uses voice storage receivers. The transmitter is located in a space at the top of the dam, and an auxiliary yagi antenna is pointed down to the powerhouse areas to ensure full coverage. (See inset photo on page 32.) The communications team is working on a wireless microphone system to support the public tours (the tour guides currently plug into amplifier jacks at each tour stop).

Communications to downstream dams is carried by a digital microwave system. This system also carries SCADA information for water flow rates, water levels and turbidity as part of the overall water management effort. Solar panel/battery bank combinations power the microwave and repeater sites. This is a logical power source given the sunny weather found in the desert southwest. The downstream dam complex uses the same frequency scheme as Hoover Dam, so, as the technicians and workers travel between sites, they are in constant contact with the main control center.



GPS receiver (small box) provides critical clocking signal. SATCOM equipment is available as a backup for LMR and microwave communications.

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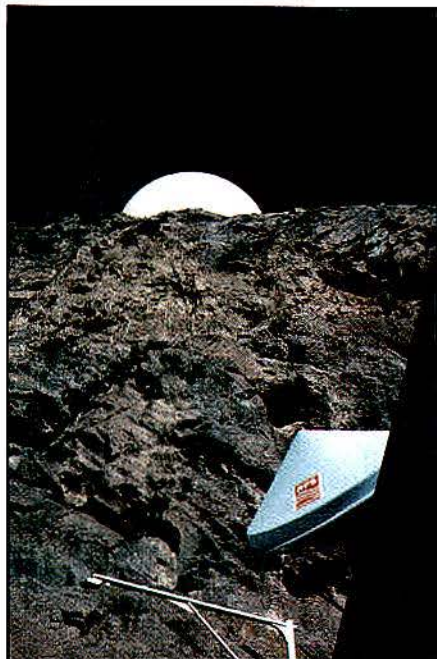
The technical staff maintains all of the communications equipment used in the vast complex. I was surprised (again) to see a pay telephone sitting on the workbench while we looked over the compact shop area. Eaker explained that his staff maintains the radio systems, the telephone switches, SONET gear, SCADA system components and sensors, SATCOM radios and just about anything else (like the payphone) that the staff uses to communicate.

All of this is spread over a wide area and maintained with a small staff. Eaker pointed out that equipment selection was rigorous and reliability was important. Vendor selection is now made at the local level, so he has been able to achieve good commonality to reduce the number and type of spares required to keep things running. The remote-control capacity of the complex allows the use of a surprisingly small maintenance staff.

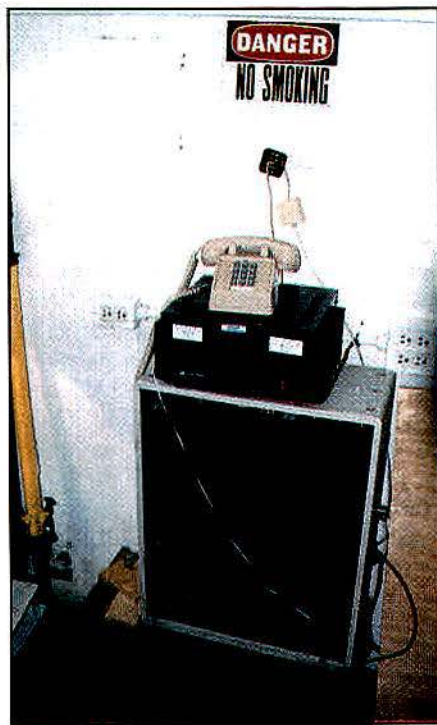
The Hoover Dam complex is federally owned but does not cost the taxpayers a dime. The original cost of the dam, some \$165 million, has been repaid to the U.S. Treasury, with interest, and operating costs come from the sale of the hydroelectric power. Equipment purchases and upgrades, including the communications systems, are approved by a board representing the companies that purchase the power from the complex. This centralized purchasing, coupled with access to General Services Administration contracts, allows Eaker to stretch the dollars spent in upgrades or new equipment.

With a vast complex to maintain, costs to control, floods to prevent and massive amounts of power to generate and





The microwave feed into the system. Even at the bottom of Black canyon, SATCOM and GPS work well.



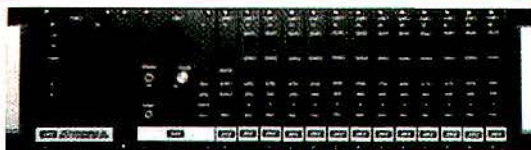
This paging transmitter serves the entire dam/powerplant complex.

deliver—the communications staff at Hoover Dam has an operation that they can take pride in every day. The contribution of the clean hydropower to a clean environment is a pleasant by-product of the flood control and irrigation effort of the Bureau of Reclamation. Radio equipment is chosen on the basis of reliability and compatibility—the ability to work in dense ac electrical fields is an indication of the quality of the product used.

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# LITIGATION EQUALS NEGOTIATION

*The saga of paging operators seeking relief from LEC termination charges continues, with lawyers as hired gunfighters. But a new, unexpected sheriff is in town, urging resolution: the FCC.*



By Vic Jackson and Michael Higgs Jr.

By now, most local operators have begun to explore their new relationship with their local exchange carrier (LEC). The reason for this exploration might be something other than curiosity. For example, your paging company may have been socked with some bills that you have to wonder about.

These bogus charges are the cost of terminating traffic on your system from the LEC. Although Congress (by changing the communications law) and the FCC (in the form of rule changes) have stated that these charges are improper, the LECs are still charging them. Why? Because it makes them more money than *not* charging them.

Some operators have continued to pay these charges, albeit with greater resistance. Because it is common for the LEC to threaten to shut off service (which after all, is somewhat integral to the paging business), the local operator continues to pay and hope that it all gets straightened out in the long run. If the local operator makes inquiry about why the LEC is entitled to keep charging these costs, the

LEC will refer to its local tariff.

If the local operator knows something about the *law* and asks for a new interconnection agreement under the Telecommunications Act of 1996 (a.k.a. 47 U.S.C. §251 and §252), the LEC will oblige the operator with its "standard agreement." The standard agreement usually says, in essence, "The local operator can continue to pay under the prevalent tariff rate." In other words—back to square one.

This merry-go-round continues until either the local operator gives up and signs an agreement that will continue the payment of bogus charges, or the local operator gets itself (Dare we say it?) a lawyer. That's right. This is an ugly problem, and it calls for an ugly solution.

The trunk facility charges for one-way paging, or other services, should not be tolerated. Operators should not pay these charges; they should demand a refund of all monies paid to the LECs for these charges since 1996. And don't buy the hogwash that these charges are "facilities" charges. The FCC doesn't buy that LEC dodge, and neither should you.

Although the law and the love of God is on your side, this does not

mean that the LECs are willing to roll over and "do the right thing." Negotiations on an agreement that calls for reciprocal compensation between the paging operator and the LEC can take months to hammer out. (You haven't seen stalling like this since the Elephant Man's wedding night.)

So, what do you do? You *sue*. Not in local court. We have enormous faith in local courts, but this is one you ought to take to the FCC. Why? Because it's quicker and frankly, the agency is on your side. After all, the agency is the one that passed the rules that the LECs are trying to avoid.

We know that appearing before the administrative law bench is often fruitless. Formal complaints sometimes age like rancid wine in the cellars of the agency. But "hail and welcome" to the new and speedier Enforcement Bureau of the FCC. A formal complaint is filed and—how about this—they actually work on it.

The Enforcement Bureau sets a time for filing pleadings, getting dis-

Jackson is president of Vic Jackson Interconnection Services, Okemos, MI.

Higgs is an associate in the law firm of Schwaninger & Associates, Washington.



covery done, articulating stipulations between the parties (like the LEC is a really big company) and actually moving the parties toward a resolution in accord with FCC rules and law. All along, the Enforcement Bureau keeps suggesting that maybe the LEC should just comply with the law and negotiate a reciprocal agreement in accord with the act, rather than have the bureau rule against it.

So, with the hammer of the Enforcement Bureau on your side, a strange thing begins to happen. The LEC now wishes to negotiate a deal. Suddenly, those terms that seemed impossible for the LEC to consider are now possible. The LEC is willing to give back the past payments and is willing to pay for future termination charges. Although there will be discussion about who pays for termination of traffic that does not originate on the LEC's system, the complaint process has placed the local operator much closer to the promised land envisioned in the Telecommunications Act.

The FCC will encourage settlement between the parties. In this case, settlement discussions mirror the very arms-length, good-faith negotiation that is contemplated under the law. Therefore, by encouraging settlement, the FCC is putting the parties in a position where the law can work as planned.

After you settle your complaint, you will get an agreement that looks pretty much like what Congress thought it should when it created sections 251 and 252 of the Telecommunications Act. OK, so Congress did not think that it would take this long, but it thinks *everything* is automatic.

One thing you should notice is that your efforts will often avoid the local public utilities commission (PUC). Why? First, local PUCs are sometimes overly influenced by the largest LECs in their area. The most important reason is because most local PUCs are not entirely comfortable with the FCC's treatment of cases under the Telecommunications Act. The PUC is likely to find more stock in the local tariff than Congress intended under the act, and if the tariff is at odds with the act, the PUC often says that the tariff will bind the parties until it is revised. We believe that this approach by some PUCs is simply: wrong.

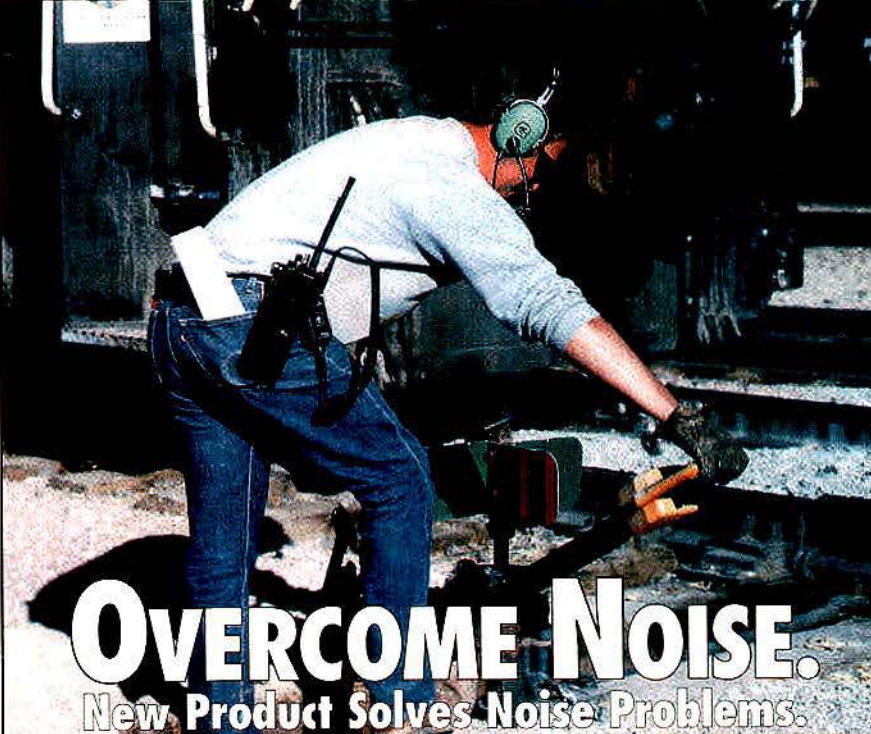
Therefore, while the local operator is fighting for fairness in its dealings with a larger LEC, the same operator may find itself educating the local PUC by

being a test case for whether a published tariff is relevant to the matter of reciprocal compensation among carriers.

If all of this seems ridiculous—it is. A local operator should not have to pay bogus charges for termination, dance around with an LEC for years regarding a proper reciprocal interconnection deal, get a lawyer who knows the difference between DID lines and DOA tariffs, bring a formal complaint before the Enforcement Bureau and then, and only then, get the LEC to sit down and discuss the kind of deal that the LEC should have offered

years before. This isn't right—or fair.

But we are not talking fairness here. We are talking about the wondrous world where telephone lines meet and tariffs are filed and traffic is terminated and interconnection abounds (in either real or virtual locations) and LATA boundaries define monopolies and where white rabbits fall down holes where DID lines run and the Mad Hatters at the FCC will follow the Queen of Hearts cry of "Off with their heads!" and the Cheshire Cat smiles on and on ... No, it's not Wonderland, it's the telecommunications industry. ■



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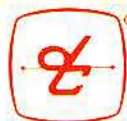
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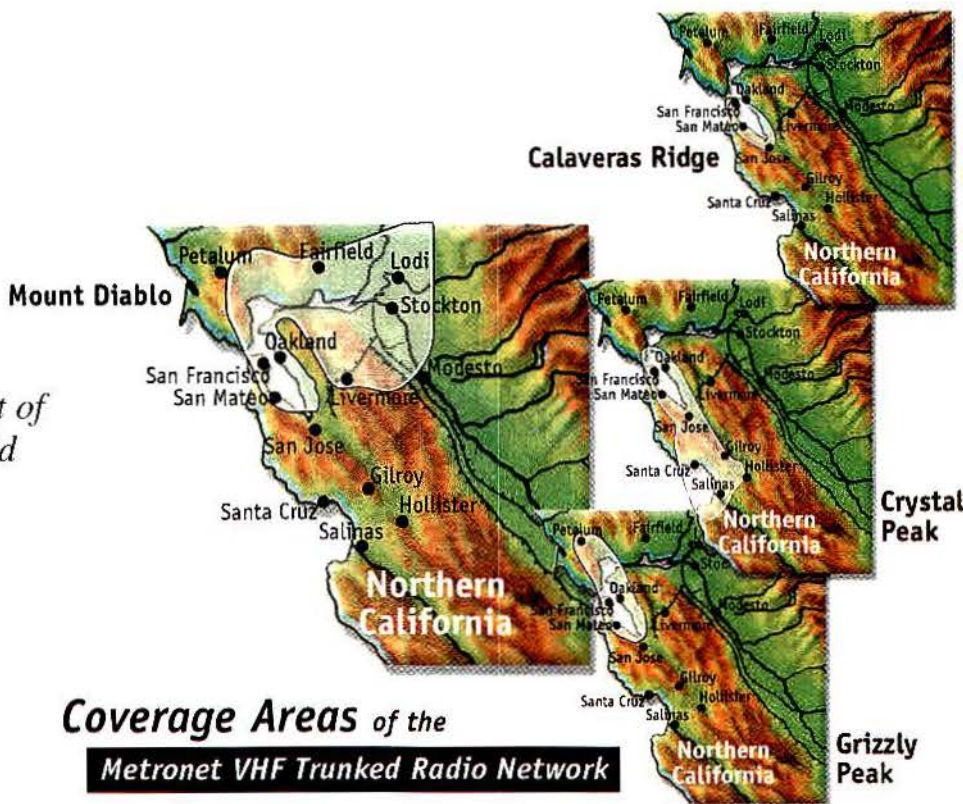
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# Trunking on VHF frequencies bodes well for SMR

*SMRs are looking for opportunities to build out trunking systems, and a wealth of frequencies are available in the part of the band where they said it couldn't be done—until someone did it.*



**Coverage Areas of the  
Metronet VHF Trunked Radio Network**

By Vaughn Entwistle

Service industries continue to be one of the fastest-growing sectors of the U.S. economy. With their business expanding, the need for dispatch services is also growing within these companies. While this represents tremendous opportunity for specialized mobile radio (SMR) service providers, the biggest limiting factor following refarming has been the lack of available spectrum.

The worst congestion is in the 800MHz band, where nationwide digital networks such as Nextel Communications and Southern LINC are aggressively competing with the small SMRs. Following the entry of these two giants, one-third of all 800MHz channels are now reported as being crowded, a significant number, since this band accounts for 60% of all licensed SMR channels.

## Expand or die

The rule of evolution is that those who don't adapt to changing conditions

become extinct. Recognizing this, many enterprising SMRs are taking advantage of the FCC's new channel offerings in the 900MHz, 450MHz, and 220MHz bands. Now, an enterprising California company is pioneering a brand-new SMR business operating in the allocated 150MHz–174MHz VHF band allocated in 1999.

California Metro Mobile Communications (MMC) is located in Menlo Park, in the heart of the Silicon Valley, about halfway between San Francisco and San Jose. The nine-person company, founded in 1984, is a successful sales and service dealership, and the exclusive representative for Kenwood Systems in the San Francisco Bay Area. MMC is also a factory-authorized sales and service dealership for Motorola Radius, E.F. Johnson and Bendix/King land mobile products.

However, co-owners John Singer (sales) and Bill Graves (service/technical) knew that to realize the

company's full potential, they would have to expand their business' scope.

"We'd never owned our own trunking infrastructure before," Singer said. "We sold systems to end-users and loaded them onto other customers' infrastructure, so we were never able to participate in the long-term revenue stream of billing for airtime. We knew that, for our long-term success, Metro Mobile needed to be able to do that."

## Finding the perfect band

But, in choosing to start an SMR business in the Bay Area, MMC faced a number of daunting challenges. First, while the area's large population promised plenty of subscribers, it also meant that frequency congestion and availability would be issues. Second,

Entwistle is editor of *Advantage* magazine for Zetron, Redmond, WA. Versions of this article appeared previously in *Advantage* and in *Telecom Exchange*, published by the Industrial Telecommunications Association, Arlington, VA.

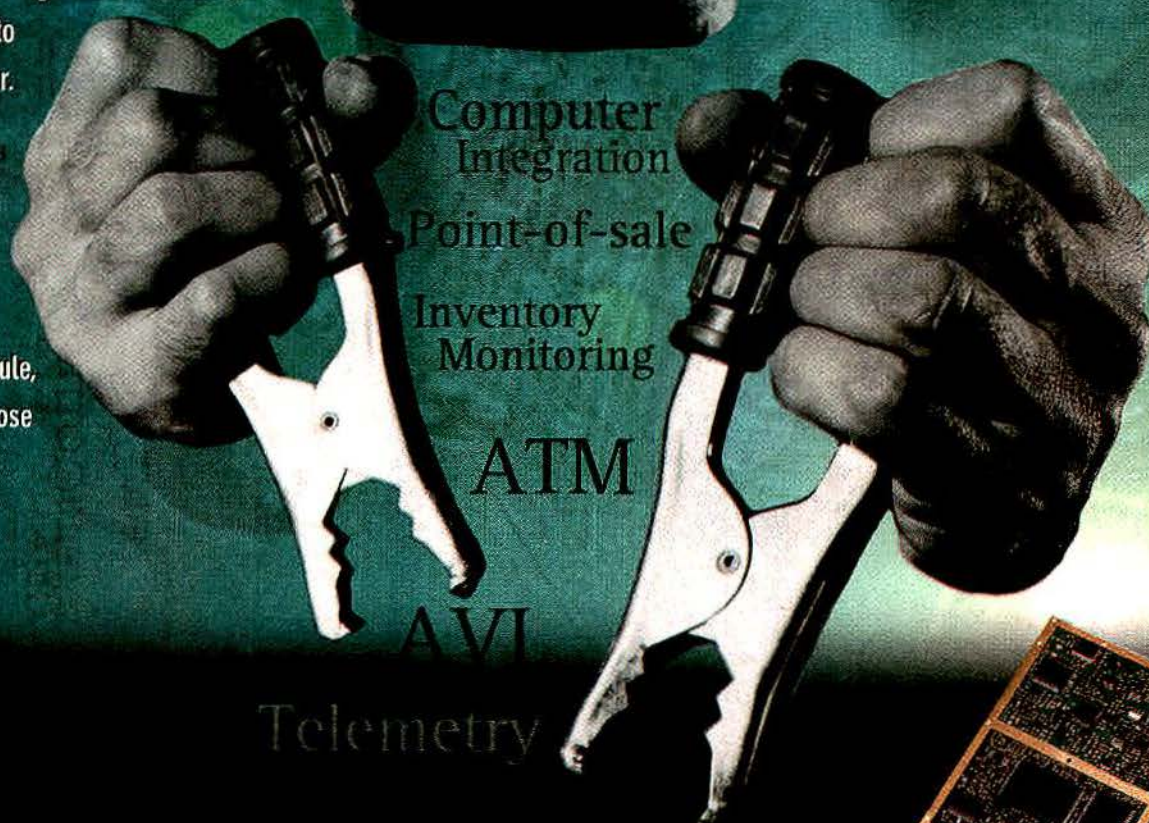
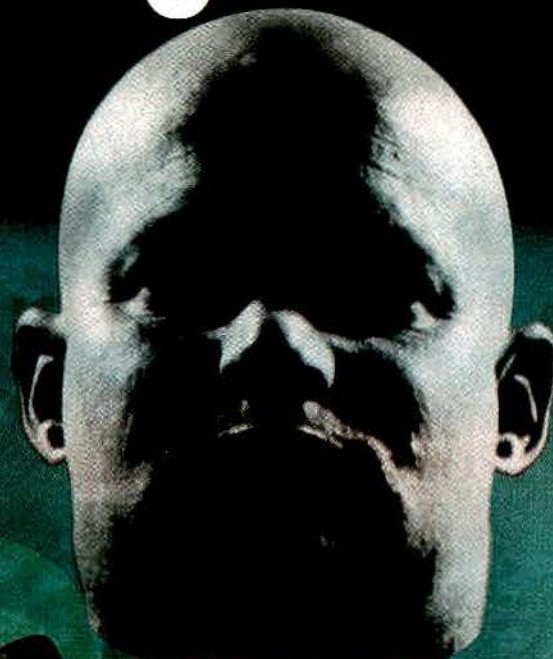


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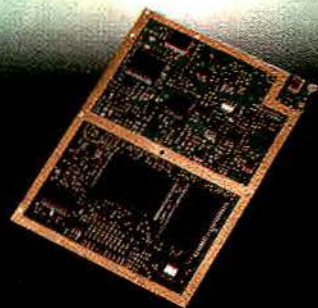
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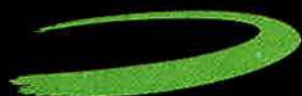
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the mountainous topography of the Bay Area would necessitate the deployment of multiple mountaintop repeater sites to provide adequate coverage. Third, Singer and Graves decided early on that the exclusivity afforded by YG (private trunked) frequencies would be a requirement. Fourth, MMC needed a system that would allow it to be a good neighbor by not interfering with older, existing systems and would also be compatible with the narrowband frequencies required by the FCC by 2002.

Knowing the type of SMR they

wanted to offer, Singer and Graves began researching frequencies.

"We knew that the 800MHz and 900MHz frequencies were basically all gone," Singer said, "But we had not had good success in the T-band lottery. Furthermore, we wanted to make a true YG trunking system, not an IG [non-trunked conventional] system where users have to monitor the frequency before transmitting. Unfortunately, I'm not sure you can find any eligible YG frequency pairs in the 450MHz band. It's our feeling that the UHF frequencies are already totally messed up, with a lot of overlap between

the various repeaters already on the air."

In the course of their research, Singer and Graves discovered that the FCC had recently changed the rules and was now allowing trunking in the VHF band (150MHz-174MHz). The immediate advantage was obvious—almost no one else was operating on these new frequencies. However, a major drawback was the fact that no manufacturers were currently producing subscriber equipment in the VHF band. Believing that such equipment would eventually become available, MMC took a calculated risk. The company applied for and was subsequently licensed for a number of YG frequency pairs in the VHF band. Although the FCC has since changed the rules to define licenses by contours, at that time the frequencies were totally exclusive for a 70-mile radius.

#### Pulling the pieces together

With their YG licenses in hand, MMC had to meet construction deadlines to hold onto them. The next part of the search focused on finding and developing the necessary subscriber equipment.

Graves, as MMC's service manager and technical expert, knew the technical requirements would not be easy.

"Because of the close spacing of the frequencies with the refarming at 7.5kHz, we faced the technical challenge of finding equipment that would work within those parameters. Nobody was making such equipment at that time because everybody's idea of narrowband was 12.5kHz, not 7.5kHz," Graves said.

Because MMC was aiming to introduce a previously unexplored trunking frequency in one of the highest RFI markets in the United States, it needed equipment with excellent adjacent-channel, signal-rejection audio quality. It also needed a supplier that would work with it to develop a VHF trunking system and then stand behind that product with first-rate technical support. In the end, MMC selected equipment from three major wireless manufacturers: DX Radio, Zetron and Kenwood.

DX Radio Systems of Los Angeles supplies repeaters and trunking systems from 900MHz down to VHF frequencies. For MMC's planned system, DX Radio developed a special VHF version of its DXRS Millennium series trunking system. This "up-scale" system features a built-in Zetron model 42 trunking controller specially modified by Zetron for the VHF application.

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MMC co-owner Bill Graves, who handles the technical side of the SMR business, had to find manufacturers with sufficiently narrowbanded equipment for VHF trunking.

market today," said Fred Goodwin of DX Radio. "Metro Mobile selected the DX trunking system for its adjacent-channel signal rejection and because it reproduced the audio and signaling better than anyone else's controller. In this emerging deployment of VHF trunking, Metro Mobile wants to be a good RF neighbor whose system won't interfere with other users."

#### System deployment

With its mountains and valleys, the topography of the Bay Area prevents any single repeater from providing 100% coverage. MMC performed beta testing at two mountaintop sites with the goal of having a total of four sites up and running before the end of 1999. Based on satisfactory coverage results from the beta testing, the company is now marketing its system as the Metronet VHF Trunked Radio Network.

Singer characterized the performance of the DX Radio and Zetron equipment as "phenomenal" at one fairly low site selected as a beta-test location, Calaveras Ridge. "It tends to cover a greater distance than any other radio system I've used, and the signal is very clear. VHF gets into some areas that neither 800/900MHz, nor UHF will," he said. "On the downside, our experiments with portables inside buildings have not been that good, since VHF signals don't penetrate man-made structures that well."

#### Serving basic dispatch needs

Singer added that the latter point is

actually not that much of a drawback because MMC designed its trunking system as a "plain-vanilla radio-dispatch system, with no frills or bells and whistles—just top-of-the-line equipment, featuring low operating cost, good access and good clarity."

MMC's target clients are the traditional users of wide-area dispatch: waste-disposal companies, couriers, delivery companies, bus and taxi companies, and anyone else who needs wide-area, over-the-road dispatching. The system, however, does have potential for more advanced services.

"There are technologies that will work on our system, such as GPS and data, which we may decide to add later," Singer said. "Kenwood is developing a new radio feature called Fleetsync, which allows for low-tier mobile status messaging built right into the Kenwood radio, and our system will accommodate that."

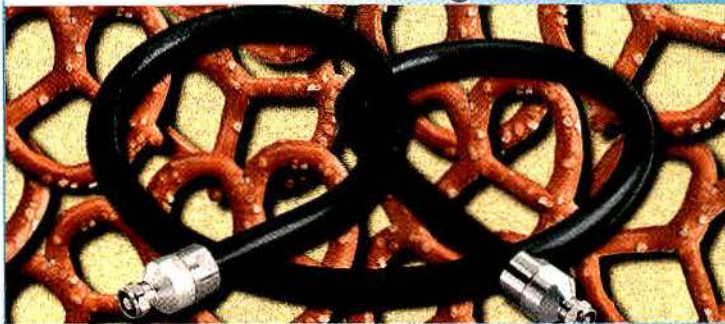
#### The future of SMR trunking

MMC sees the expansion into these new frequencies as a trend that will only get stronger as the squeeze on available radio spectrum increases.

"I think there are a whole bunch of SMRs who are in the same boat we are, in that they are looking for opportunities to build-out their own trunking system," Singer said. "There are a multitude of VHF frequencies available throughout the U.S., and I think it's the next frontier for companies like ours." ■

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# Simulcast rebuild

*The revamping of a 30-year-old legacy public safety network requires upgrades in interconnects, controllers, radios and clear communications about software.*

By Walter Rheingans

Reworking a public safety radio communications system while it remains in service is a tough task. Here is a little story about a walk in the "100-acre wood," [well, in San Luis Obispo County, it's really about 3,300 square miles] and how we are upgrading and rebuilding our simulcast public safety radio networks to provide better service.

## An oxymoron?

Some statements are self contradictory. I'm sure you have heard jokes about "jumbo shrimp" or "military intelligence" as examples of oxymorons. Ten years ago, "simulcast solutions," would have been considered an oxymoron. The ideas were good, but the implementations were difficult, and the results were often poor. Today, many good solutions are possible, and it is no longer so difficult. Today, you can purchase completely packaged simulcast systems or stitch

together your own from a variety of suppliers.

## The legacy system

The County of San Luis Obispo, CA, has three public safety networks and one general business simulcast radio network constructed from a mix of technology. Our networks have been in service since 1972, when the hardware was less robust than the engineering designs. The county implemented a system with tube-type transmitters, quartz high-stability oscillators (HSO) and bulk delay-line time correction with an analog microwave radio interconnect.

In 1972, the model was the Orange County, CA, public safety simulcast radio system, and the original and successful work of Gary Gray. For our own implementation, the concept worked better in theory than in practice because we have such rugged topography.

Over the years our system was upgraded various times, as technological

improvements became available. Now we're upgrading again. We are stitching it together with a variety of existing equipment and new suppliers.

## Project goals

"Reconfigure, improve and maintain service" are the project goals. The plan to accomplish these goals includes reconfiguring our microwave interconnect system from a loop into a hub-and-spoke "star" layout to simplify simulcast issues such as timing. This also shortens some paths and provides a better interconnect system.

Improvement of the quality and coverage area is important because the county is such a rugged and difficult area to cover. We must accept that coverage of 90% of the area, 90% of the time (90/90) may never be accomplished with a reasonably priced system. We plan for as close to 90/90 in the main population areas as we can accomplish.

Maintenance of service during this rebuild project is essential because our business is public safety radio support. We must keep the existing systems running except for brief outages.

## Project description

► **Replace microwave radio interconnect** — Replace, replace, replace. The first item to replace is the microwave radio interconnect, changing from an analog looped system to a Harris Constellation digital system. Digital gives greater control over the timing and phase of the connected radios. The Constellation is a new, software-defined and software-operated radio with the necessary monitored hot standby and redundancy features for carrying public safety radio traffic. We cut traffic over to the system in January.

► **Replace radio sets** — Successful simulcasting requires that all radio sets be of the same type, so we are replacing

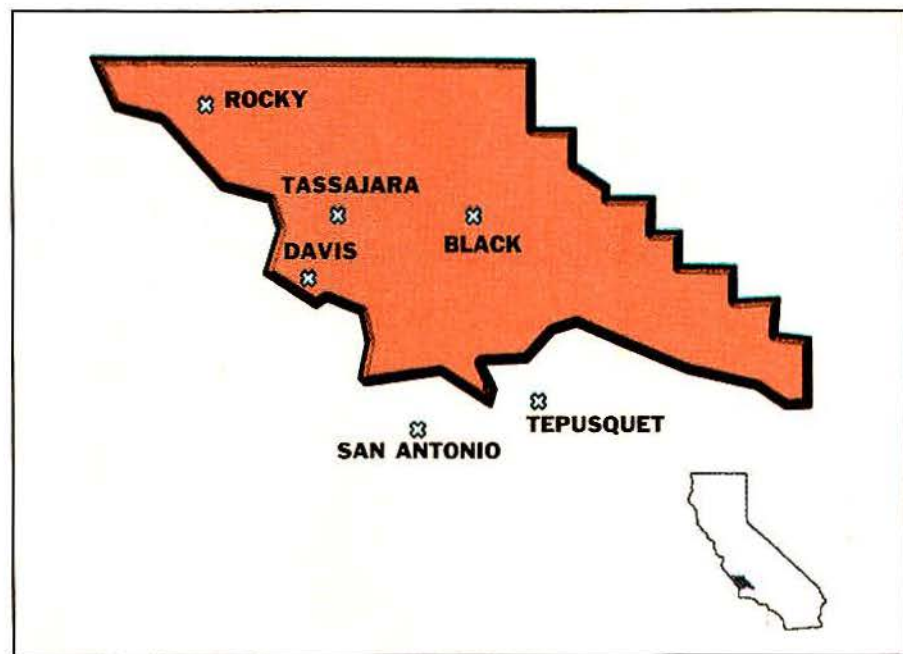


Figure 1. Map of San Luis Obispo County sites.

Public safety/government communications writer Rheingans works with the County of San Luis Obispo, CA.



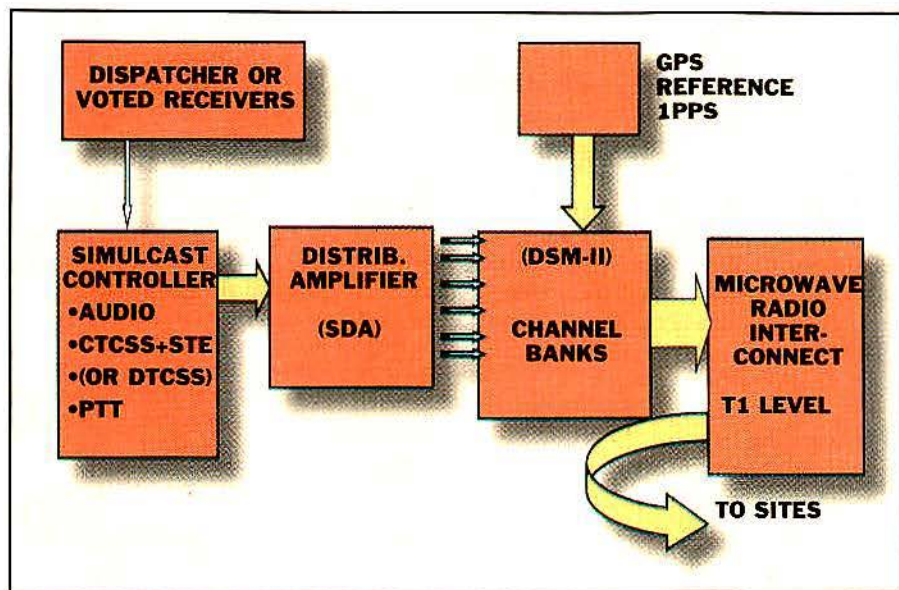


Figure 2. Main site controller simulcast scheme.

many units. When new Ericsson Mastr-III replacement radio sets are received, they are tagged for system and site placement to keep the same production and version all together in a given system. The fewer variations within a system, the better the simulcast results. Soon all the systems will have matched radio sets. Installations are difficult because of facility space constraints.

► **Replace HSO with GPS** — The schedule for replacing our not-so-stable HSO with GPS-disciplined oscillators is on target. Over the years, the "high stability" in the HSOs has been a problem. At 460MHz, a little drift in the channel oscillator creates a big problem. With the advent of GPS for time and frequency lock, stability is superb and constant. GPS is a godsend for simulcast. San Luis Obispo now operates Zyfer Odetics Telecom Accusync GPS-disciplined reference oscillators at all the simulcast sites. On some older radios, we install external synthesizers to allow use of GPS reference.

► **Replace time correction with DSM-II** — The last necessary task is to replace "bucket-brigade," manually adjusted, time correction with Motorola DSM-II channel and time-delay adjusting cards. This technology takes care of all the time-delay correction, with the correction tied to GPS. The technology is self-correcting for system variations and reasonable amounts of route switching. These cards are specific to the microwave radio Integrated Multiple Access Channel System (IMACS) channel banks by Premisys (Motorola Tensr). IMACS channel banks, with conventional four-wire E&M and two-wire FXS channel cards and DSM-II channel cards, are now installed at all simulcast

site locations.

Figure 1 on page 44 shows the locations for the major radio sites. (Some receiving and fill-in sites are not shown.) The county's southeast corner is sparsely populated because the San Andreas fault defines the east county line. It is not a nice place to live. It also lacks good radio system coverage.

## Main site scheme

The San Luis Obispo main terminal site contains all necessary hardware and systems to initiate, control and test our simulcast system. In the main site diagram in Figure 2 at the right, you may notice that we left out the ordinary details of receive audio via voter panels, and just showed the essential simulcast information. In our rebuild, the Motorola Conventional Simulcast Controller Interface (CSCI) does much of the "heavy lifting" to make the system work. The CSCI accepts the outgoing audio stream, adds CTCSS (if desired), adds reverse burst (if desired), performs pre-emphasis, takes care of limiting and passes along the push-to-talk (PTT). The Motorola Simulcast Distribution Amplifier (SDA) takes this signal and splits it up for as many as 10 channel feeds. This scheme does one-point audio and CTCSS processing to modulate all the simulcast radios with exact replicas of the one signal, once it has been corrected for transport-time delay.

Motorola has a well-designed transport-time-delay correction scheme with the Digital Simulcast Module, model 2 (DSM-II), which plugs into the digital channel banks (Motorola Tensr by Premisys). The

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CONNECTORS



DSM-II uses the one pulse-per-second synchronization from a GPS unit to set and manage time correction from the main site to the remote, high-level site. Harris Constellation microwave radio interconnects the sites.

### A typical mountaintop scheme

Our typical mountaintop or high-level radio site scheme, as depicted in Figure 3 below, demonstrates how we connect the DSM-II channel signal to the radio. Note that the GPS unit now provides timing information to the channel card at one pulse-per-second and to the radio reference.

The Zyfer Odetics Telecom Accusync GPS unit provides five 10MHz outputs and a couple of one pulse-per-second outputs synchronized to the GPS clocking, thus transferring internal GPS rubidium timing standards from GPS to our public safety radio network. This GPS-disciplined reference for the radio is a vast improvement over traditional HSO units, and because the sites are all locked to the same "transfer reference," they never drift. No significant routine maintenance is necessary. (Again, the ordinary receiving path has not been illustrated here.)

### Technology inventory

Let's review the technology used in this system rebuild. A digital microwave radio interconnect gives us T1 technology for digital cross-connect and total control of our sites and channels. The

GPS frequency reference eliminates all long-term, station-to-station carrier drift. (No more wobbling, rolling beats between transmitters and no more zero-beating oscillators during maintenance.) Motorola DMS-II channel cards by Premisys do all the hard work for the system and allow us to send CTCSS throughout the system. Of course, changing our interconnect from a loop to a star connection is cleaner and more manageable, as well as allowing shorter hops on several paths.

### The learning curve

As this rebuild progresses, we have learned some things. Rain, sleet and the dead of night (along with almost everything else—including project scope-creep), will delay a project. Deliveries will be delayed. Project technicians will have other priorities imposed on them.

Technical details become important, such as running the GPS on battery power. We do. Another agency we reviewed did not. That system lost sync and "wobbled" every time there was a power outage or a standby generator switchover. Then it took a few minutes for it to stabilize. We use a dc power option and the site battery plant for the Accusync GPS, and it has never "burped" with a loss of synchronization.

Have a lot of attenuation pads on hand. First, the radio receivers are designed to feed about 15 miles of wet-paper-insulated No. 22 wire, thus driving at about +10dBm to +20 dBm. Our

## Coverage challenge

County of San Luis Obispo, CA:  
East border is the San Andreas  
earthquake fault.

High-level radio sites: eight  
(used in simulcast): six

Area covered:

3,300 square miles

Span, east-west: 105 miles

Span, north-south: 60 miles

Span, NW-SE: 120 miles

Lowest elevation: Sea level

Highest elevation: 5,165 ft. AMSL

Lowest high-level site: 1,010 ft. AMSL

Highest high-level site: 3,246 ft. AMSL

Original simulcast channels:

one VHF; three UHF

Planned simulcast channels:

two VHF; six UHF

interconnect microwave wants to see about -16dBm. Without a 26dB pad, the radio output adjustment, whether digital or analog, is at the end of its range and is difficult to set or adjust. With a pad in line, the adjustment is back into its preferred center-of-range and much easier to set up. We use telco-style "66 blocks" with push-on pad units in place of normal bridging clips. Also, the GPS is usually hotter than the radio reference input requirements and is well served with 10dB or 15dB in-line attenuation.

Software runs everything today, but we find that equipment manufacturers don't always communicate the software information to the poor technician in the field doing a setup. It is hard to find the one person who really knows the software and equipment interactions and settings. For instance, for the Ericsson MASTR-III radios, we use two different software packages with similar—but not identical—features. One program works in batch mode, and thus the technician cannot "tweak" adjustments in real time. The second software works in real time but does not do all the adjustments the first one can do.

You also are never sure you have the latest version, until factory support gives you a solution to a problem along with the qualification "... If you have the latest version and update; otherwise I don't know how to solve your problem."

### Putting it all together

Simulcast solutions is no longer an oxymoron. The end of our project is near because the last of the required hardware just arrived (six months and one week after the order was placed). As soon as it is all installed, we will have a mixture of great technology providing San Luis Obispo County with improved public safety radio communications. ■

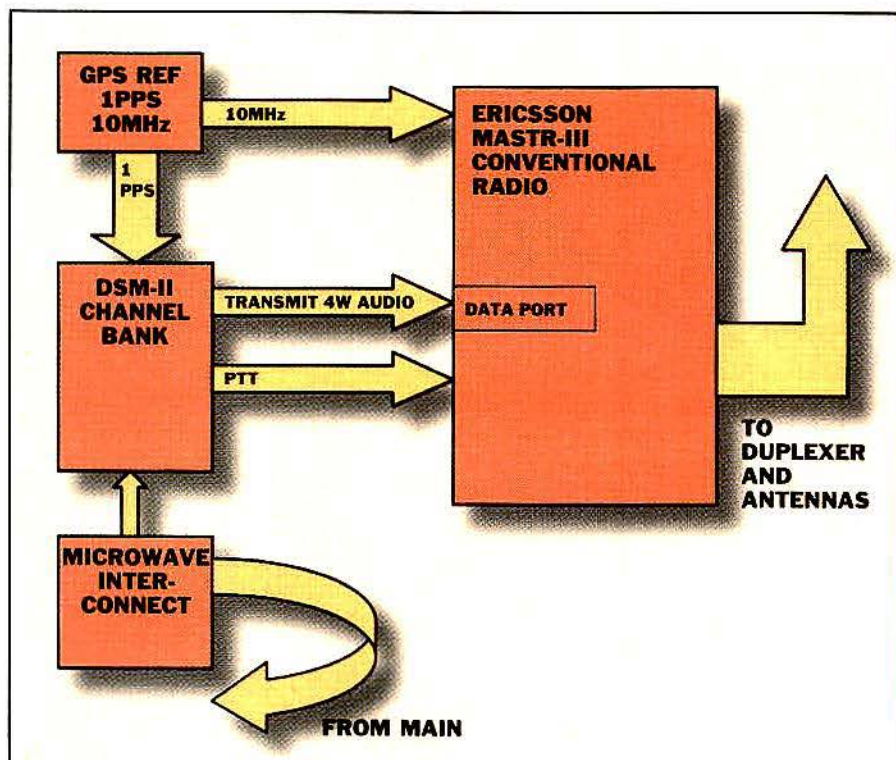


Figure 3. High-level site simulcast scheme.



APCO, the Association of Public-Safety Communications Officials-International will present the 66th APCO Conference and Exposition on Aug. 13-17, 2000, in Boston. APCO is the world's oldest and largest non-profit professional organization dedicated to the enhancement of public safety communications. More preview information follows in next month's issue of *MRT*.

## Past and present merge in Beantown

As the host city for the 66th Annual Association of Public-Safety Communications Officials-International (APCO) Conference and Exposition, Boston is in position to show the members of the public safety communications industry just what the city has to offer. And with a history that includes everything from the Boston Tea Party to that little bar where everybody knows your name, Boston greets its guests with a wide range of attractions and activities that exhibit that background.

As one of the original cities of the 13 colonies, Boston embraces its colonial history and recreates it through Plimoth Plantation, an hour south of the city. A living, breathing portrait of pre-revolutionary Boston, Plimoth Plantation gives visitors a look into the daily lives of the city's founders in 1627. Food is prepared family-style as it was in the 17th century, and wood carvers exhibit their craft while the Mayflower II sits proudly in the harbor.

Fast forward to present-day Boston, and visit Copley Place or The

City Under Glass at the Prudential Center for a more modern shopping and dining experience. Both are located in Boston's Back Bay and offer innumerable ways to burn up your shopping allowance.

The TV show may be relegated to late-night reruns, but you can still belly up to the bar at Bull & Finch Pub, the inspiration for the popular sitcom *Cheers*. Norm, Sam and Woody might not be there, and there won't be any witty remarks from the customers followed by a laugh track, but you can try the bar's famous Bull & Finch Burger and Bloody Mary combo rated "Boston's Best" by the *Boston Globe*.

If you're in a hurry and want to try to take it all in at once, visit the John Hancock Observatory for the view from the tallest building in New England. From atop the 740-foot structure, the city's "high points" spread out below on a miniature scale. Take in Fenway Park, Fanueil Hall and Quincy Marketplace, New Hampshire's White Mountains and historic Boston Harbor, the site of the Boston Tea Party. —M.H.

## Keynote Speaker: Gloria Tristani

Gloria Tristani was sworn in as commissioner of the Federal Communications Commission (FCC) by President Bill Clinton on Nov. 3, 1997.

As a vocal opponent of children's exposure to TV violence, Tristani chaired the FCC's V-chip task force in 1996. She has served on the New Mexico State Corporation Commission since 1994. Before her appointment to the FCC, Tristani was an attorney in private practice in Albuquerque, NM. She was named one of the nation's most influential Hispanics by *Hispanic Business Magazine* in 1996 and 1998.

Tristani received a bachelor's degree from Barnard College of Columbia University and her law degree from the University of New Mexico School of Law.

## Featured speaker: John Bunnell

Before hosting the Fox network's reality-based series "World's Wildest Police Videos," John Bunnell spent 27 years in law enforcement. Beginning in 1968, Bunnell held positions as head of internal affairs, chief deputy in charge of corrections and sheriff of Multnomah County, OR.

After being featured in several episodes of Fox's law enforcement show "Cops," Bunnell agreed to host the ABC series "American Detective" in 1996 and then moved on to host such Fox specials as "World's Scariest Police Chases," "World's Scariest Police Stings," and "World's Worst Drivers Caught on Tape."



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## BIRD Electronic Corporation

### Bird Electronic

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[www.bird-electronic.com](http://www.bird-electronic.com)

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### Citel

Citel RF coaxial surge protectors are available with N, TNC, SMA, BNC connectors and feature a low insertion loss.

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## Communications Specialists

Communications Specialists' tone-signaling products include CTCSS, DPL, ANI, two-tone sequential, shared repeater tone panels, Morse code identifier, voice encryption and narrowband filter kits.

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## Com-Net Ericsson

Com-Net Ericsson is fo-

cused on the land mobile radio market, offering complete communications products. For more information, please visit the Web site at [www.com-netericsson.com](http://www.com-netericsson.com).

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## Control Signal

Since 1972, Control Signal has manufactured digital ANI and Morse code station identifiers. The micro-miniature ANI has Motorola MDC-1200 and caller ID signal formats and can fit in the smallest radios. Call 800-521-2203.

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## CPI Communications

The MCR Alpha series remotes provide remote control of Motorola's Maxtrac, Radius GM300, Kenwood TK630/730/830 and Midland's Syntech XTR radios. The remotes display channel number and user-programmable name.

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## Crescend Technologies

Crescend Technologies manufactures continuous-duty RF power amplifiers for UHF, VHF, 800MHz and 900MHz applications. New-generation products include modular 28V LDMOS designs for rugged, reliable performance. All amplifiers carry a three-year warranty.

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## Daniels Electronics

Daniels Electronics manufactures fixed and portable radio base stations and repeaters for two-way voice, trunking, mobile data, cross-band, and paging applications.

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## David Levy

David Levy offers a multitude of hardware, tools and accessories for two-way and

mobile electronics installation. DLC distributes everything from wire and test equipment to CB microphones. A free catalog is available. [www.dlcparts.com](http://www.dlcparts.com).

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## Fiplex Communications

Fiplex Communications manufactures filters, duplexers, transmitter combiners, receiver multicouplers, tower-top amplifiers, bidirectional amplifiers for radio systems, cellular AMPS/GSM, PCS and trunking SMR.

Circle (310) on Fast Fact Card

## JPS Communications

JPS Communications manufactures ancillary equipment including cross-band interfaces that interconnect multiple radio bands and receiver comparators that vote conventional analog and trunking signals.

Circle (311) on Fast Fact Card

## Link Communications



Link Communications' CSM-1000 service monitor features a digital spectrum analyzer, an RF receiver, a generator, a digital oscilloscope and a 200W dummy load.

Circle (312) on Fast Fact Card



## M/A-Com's Opensky

M/A-Com's Opensky wireless private network is a packet-switched digital mobile communications network with integrated voice and data that operates over an IP backbone.

Circle (313) on Fast Fact Card



## Moducom

Moducom introduces Ultracom 2000. Now 9-1-1

and radio dispatch are in one console system, which can mean lower initial costs. The 9-1-1 and dispatch components can be purchased separately. The system offers flexibility, allowing lower support and programming costs. Free demonstration software is available at [www.moducom.com](http://www.moducom.com).

Circle (314) on Fast Fact Card



## Motorola

The Motorola R2600 series of communication systems analyzers tests analog and digital two-way radio systems. The platform provides support for IDEN, MPT1327 and 1343, and Motorola analog trunking.

Circle (315) on Fast Fact Card



## Novatel Wireless

Novatel Wireless offers Merlin PC cards, Minstrel and Sage modems, and Expedite embedded modules. For information, call 888-888-9231 or check out Web site [www.novatelwireless.com](http://www.novatelwireless.com).

Circle (316) on Fast Fact Cards

## Paging & Wireless Center

P&W Service Center is now a stocking distributor for the Relm/BK line of radios, including the MP series of small, yet feature-rich, 32-channel, scanning portables. Call 800-822-2180.

Circle (317) on Fast Fact Card

## Ritron

Ritron manufactures a complete line of land mobile radio products including portables, mobiles, repeaters, data telemetry modules and accessories for worldwide distribution.

Circle (318) on Fast Fact Card

## SCA

SCA is leading the market



in tone and voice paging. Along with tone and voice, it has extended its line to include POCSAG digital paging.

Circle (319) on Fast Fact Card

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Shure's 810 speaker microphone, part of the Modulink system of interchangeable microphones and cords, provides sound performance and reliability, even in foul weather.

Circle (320) on Fast Fact Card

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#### Telewave

Telewave designs and manufactures antennas, combiners, filters, tower-top preselectors, duplexers, wattmeters and many other wireless system products covering 2MHz to 2.7MHz.

Circle (321) on Fast Fact Card

**TELEX®**

#### Telex/Vega

Telex Communications/Vega is a manufacturer of communications control consoles (from a single line up to 24 lines) radio termination adapters, amplifiers, line bridging modules and tone encoding, and decoding equipment.

Circle (322) on Fast Fact Card

#### Thunder Eagle

Thunder Eagle is a designer, manufacturer and distributor of weather alert radios for emergency management and other professional users. [www.thuneagle.com](http://www.thuneagle.com)

Circle (323) on Fast Fact Card

**T TIMES**  
MICROWAVE SYSTEMS

#### Times Microwave Systems

Times Microwave Systems has announced the availability of non-solder 'EZ' TNC

male connectors for its LMR-400 and LMR-600 flexible, low-loss coaxial cables. The connectors designated as EZ-400-TM and EZ-600-TM are designed to operate at frequencies as high as 6GHz.

Circle (324) on Fast Fact Card

#### TX RX Systems



TX RX provides multicouplers, combiners, signal boosters, antennas, tower-mounted preamplifiers, duplexers, filters and other RF system products for use in the 100MHz to 1GHz range.

Circle (325) on Fast Fact Card



**STANDARD HORIZON**

#### Vertex Standard

With experience in land mobile radio, Vertex Standard offers a wide variety of public safety equipment from cross-band repeaters to

public safety portables and mobiles.

Circle (326) on Fast Fact Card

#### Vocom Products

Vocom Products manufactures LMR, SMR and paging power amplifiers. These designs are cost-efficient and reliable. Offerings include mobile and continuous-duty amplifiers.

Circle (327) on Fast Fact Card

**ZETRON®**

#### Zetron

The model 4020 from Zetron is a 20-channel, common controller that supports as many as six Series 4000 operating positions, including the model 4217NT dispatch workstation, the model 4217B CRT console, the model 4118 rackmount button console and the model 4018 desktop button console. The architecture is identical to the model 4048.

Circle (328) on Fast Fact Card

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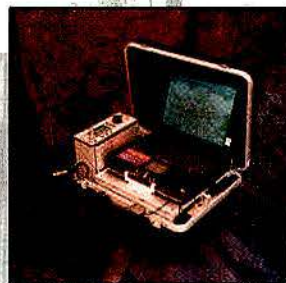
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Circle (36) on Fast Fact Card



## Motorola reporting requirement divides dealers

Jules K. Neuringer, president of Portronix Communications, Brooklyn, NY, faces the termination of his Motorola Radius communications products reseller agreement because he doesn't want to provide Motorola with what he calls proprietary customer information.

Motorola wants Neuringer and all of its resellers to report "end-customer made-sale" data every month. Neuringer said that the information Motorola wanted includes the purchaser's industry classification, contact name, title, company name, address and phone number. It also includes the product model number, serial number, sales price, marketing method and whether the sale is the first to that customer.

Aside from compliance, the alternatives Motorola had offered to Neuringer are for Portronix to cancel its reseller agreement on its own initiative or to let Motorola do it. The reseller agreement expired on June 30.

The Motorola dealer contract said, in effect, "You must send us monthly marketing reports in whatever form we specify," Neuringer explained.

The requirement for such detailed customer information "was an eye-opener because I thought our customer list was our property and none of anyone else's business," he said.

Neuringer said he has letters from customers who say that if Portronix supplies such information to a third party, they won't do business. He said that his customers knew about Motorola's requests.

"Who is my allegiance to? The customer, or to Motorola?" he asked.

"Either I'm a jerk in standing my ground, or there are other dealers being bullied equally."

Neuringer said that Motorola told him, "Don't tell the customers you're giving us the information."

"I said: 'That's not fair. My customers have a right to know I'm giving details about them to a third party.'"

### Some other dealers comply

Some dealers embrace Motorola's marketing strategy.

David C. Reeves, owner of P & R Communications, Dayton, OH, said, "What other choice do we have? But we're not worried. They're my customers, and I don't care if Motorola knows who they are because I'm doing my job."

Motorola continues to sell large systems direct from the factory. Reeves said that add-on business to those large systems might flow to dealers. He said he believed that Motorola's marketing strategy would allow the company to control the channel of distribution better.

Reeves' primary concern was with data entry and the labor cost to do it. His business management software vendor, CRI, is working on automatic processing to transfer data from P & R Communications' records automatically to Motorola's reporting software.

William Landis, owner of TuWay Wireless in Bethlehem, PA, said that his key concern was the labor required for entering sales information in Motorola's software. But he doesn't fear that Motorola might use the information to sell directly to his customers.

At Central Communications & Electronics in Knoxville, TN, owner Tim

Curbow pointed out that when Motorola used to have factory sales representatives, it had the kind of information it now seeks from its dealers.

"I see it as a positive to allow them to tailor marketing plans for direct mail to analyze data," Curbow said.

### Motorola responds

Speaking for Motorola, Wayne Foret, vice president of the Radio Products Americas Group Distribution Division for the United States and Canada, said that the company is modernizing its dealer channel marketing program to a level similar to manufacturers in other industries, such as automobiles and appliances.

He said most dealers have no marketing specialist. In contrast, the largest dealers have a marketing manager and conduct catalog campaigns.

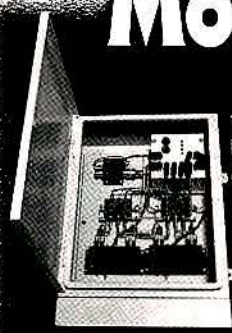
"We not only want to find out end-user requirements, we want to bring the end-users to the dealers' doors, coupons in hand, saying, 'We want to buy another radio,'" Foret said.

Bruce Heyman, director of strategy and business development for Motorola's Radio Products Division, added that it's common for auto purchasers to receive coupons, thank-yous and information in the mail targeted to the car model purchased.

"The mailings look as though they come from the dealer, but they come from the manufacturer," he said.

He said that Motorola dealers have the ability to draw reports from the database. They can target mailings to existing customers or to potential customers because of Motorola's link with Dun

## Mobile, Cellular and SMR



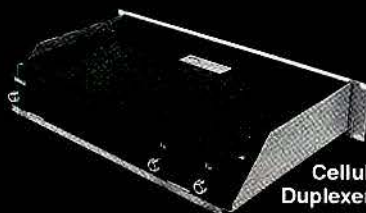
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& Bradstreet (D&B). Dealers receive reports on "made sales" and access to the D&B database, letting them know about businesses in their area.

Foret added, "If you were a two-way radio dealer that carries several manufacturers' products, and one produces leads for you, that manufacturer is adding value. We think that's a good reason to be in business with Motorola because it brings leads and low-cost, add-on sales," he explained.

Foret also commented about apprehensions dealers might have about Motorola using the information to sell directly to their customers.

"In two or three years, dealers will have more responsibility, not less. It would be foolish for us to turn on the dealer channel like that. Our cost now is less because the channel belongs to the dealers. They pay the insurance and salaries connected with sales. What we save shows up as a discount to dealers. We have to strengthen the channel. They say, 'Help us with our marketing.' One way we can is to help them avoid having to cold-call for every radio sale and to go into the databank and remind customers that this is a good time to consider an add-on or trade-out," Foret said.

Heyman said that it wasn't possible for Motorola to make exceptions regarding the type of information it requires from dealers because of anti-trust law regarding manufacturer relationships with dealers.

"You have to treat every dealer the same way," he said.

Second, he said that it would be against Motorola policy to mislead customers about the information being collected.

"We have no problem being forthright with customers in collecting the information and explaining what we're doing with it. It gets matched up with D&B. The information helps us to do the best job of matching to D&B. We're trying to get the 'Duns' number to tell us, for example, whether the customer has one location or many locations. We wouldn't want our dealers to tell customers that we're not collecting the information," Heyman said.

Heyman agreed that the program was labor-intensive.

"We are deploying a new version of the software in mid-May that will allow a productivity or speed improvement factor of four to 40. That's a big range, and the actual factor depends on how large the dealer database is and how big the computer is. Some tasks that used to take 40 minutes will be done in well under a minute," Heyman said.

#### Still some questions

Back at Portronix, Jules Neuringer remains concerned and unsatisfied.

"Shouldn't our customers have the right to 'opt out' of having specific, and possibly proprietary, information transmitted to a third party?" he asked.

"Unless other dealers wake up and question the direction in which Motorola is headed with regards to end-user buying habits, they may discover that one day Motorola will be selling directly to those dealers' customers," he said.

"Of course, dealers have always had a choice regarding products to sell. We can certainly offer our customers the

opportunity to purchase comparable products from other, less-nosy manufacturers. Given the choice between having detailed purchasing information relayed to a manufacturer, or having their buying habits remain confidential, I think most customers would choose the latter," Neuringer concluded. —D.B.

*Editor's note: See [www.mrtmag.com](http://www.mrtmag.com) for a copy of the letter from Motorola dealer Jules Neuringer; comments from other dealers and additional information from Motorola about the Impact 21 program. Click on "Online Extras" and go to "Letters to the Editor" for Neuringer's letter and to "Industry News" for the expanded story.*

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## Wireless messaging aids pager service

The Ohio-based communications provider Cleveland Mobile Tele-Trak has experienced a 69% increase in business over last year and an 80% increase expected overall for 2000, according to a Hark Systems press release.

According to Ronald Lauber, general manager of Cleveland Mobile, the company's success is attributable to the popularity of "Wireless Messaging," the premium service that

offers alphanumeric paging.

"The customers feel they are getting more service for less," Lauber said. "I don't think we've sold one numeric pager in two and a half years, that's how well this concept sells."

Wireless Messaging is part of the Omega System provided by Hark Systems, Charleston, SC. The system gives the user the ability to send transcribed messages to an email account.

## LMCC questions FCC refarming

The Land Mobile Communications Council (LMCC) filed supplemental comments concerning issues raised on reconsideration of the FCC's Refarming Second Memorandum Opinion and Order, FCC 99-68, released July 6, 1999.

Some of the petitions for reconsideration dealt with interference concerns on the VHF and UHF frequencies historically shared by manufacturers, forest products companies, and utilities, and petroleum and telephone companies.

At its annual meeting, the LMCC agreed to urge the commission to adopt a rule to avoid interference on these frequencies. Under the new rule, any coordinator with an application whose interfering contour would overlap an incumbent's service contour would be required to contact either the incumbent or its preferred coordinator before forwarding the application to the Wireless Telecommunications Bureau's Gettysburg, PA, licensing offices.

On receipt of the notification, the incumbent or its coordinator would have the opportunity to express its concurrence, or lack thereof, to the originating coordinator. In most cases, the proponent and incumbent are expected to use engineering solutions to resolve the problem.

## RSI joins forces with Day Wireless, others

Radiofrequency Safety International (RSI) has formed alliances with C.E.S., Day Wireless, Gotcher Tower Service and Telecom Global Solutions. These companies are certified field service representatives for RSI, and they will offer consulting and training services for RSI customers. The expanded services are to help RSI clients bring their telecommunications and manufacturing installations into compliance with the FCC's OET Bulletin 65 regarding RF safety by the Sept. 1, 2000, deadline.

## RadioSoft opens new, expanded facility

RadioSoft, Edgewater, FL, held a ribbon-cutting ceremony for its new, expanded facility in June. The new facility allows for expansion of the company's programming, engineering and coordinator staff. Separate areas have been created for a generator backed-up server room as well as a conference and training center.

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## FCC Notes

### Grab an RF probe or watch your back

Sept. 1 is the deadline for compliance with FCC rules (47 C.F.R. 1.1311) on human safety limits for exposure to RF emissions. However, some operators and carriers seem to want to wait until they receive that "Notice of Forfeiture" on the door. Survey estimates presented by SiteSafe at the SOMA conference in mid-May indicated effort to document exposure and to provide worker training accounted for about 40% of PCS and cellular sites. Only about 20% of paging operations surveyed and less than 10% of two-way radio, utility operations, municipal sites and broadcast sites were ready. This procrastination has been attributed to mistaken assumptions about the nature of "categorical exclusion" in the rules, which applies to only a few operations. Although the FCC and OSHA have limited enforcement manpower, several industry observers expect a repeat performance of the FCC's high-profile "stings" on 900MHz operators and pirate FM stations. The "new" Enforcement Bureau has been flexing its muscles, and this will be a highly newsworthy target. Prime targets: rooftop sites and operations involved with trade unions.

### Meanwhile, closer to home ...

To further underscore its commitment to the RF emissions issue, the FCC, with the Local and State Government Advisory Committee, has released a "plain-English" guide on RF for local governments. "A Local Government Official's Guide to RF Emission Antenna Safety Rules" is less a guide than a handbook or primer, as it runs to 37 pages. The guide includes a discussion of how local officials and citizens can initially contact a facility's operator to answer questions about compliance. It also covers the procedures to determine compliance and to bring violators into compliance. Look for it to be in the hands of your local zoning board before the summer is out, and look for your own copy on the Web at [www.fcc.gov/rfsafety](http://www.fcc.gov/rfsafety).

### UTC files to expand coordination

The United Telecom Council (UTC) has filed with the FCC for certification to provide coordination for the 800MHz and 900MHz PLRM Industrial/Land Transportation and Business Category frequencies. UTC has already been providing coordination below 512MHz. Comments on the Public Notice are due June 26; reply comments on July 12.

### New Form 601

The FCC has released a new edition of Form 601, "Application for Wireless Telecommunications Bureau Radio Service Authorization." The new form includes "demonstration license" as an option, explains emergency "special temporary authority," includes "band manager" under regulatory status and revises Schedule H to accommodate moving land mobile onto the ULS. —D.K.

## Chadmoore Wireless buys DCMA technology

Chadmoore Wireless Group, Las Vegas, announced an agreement with ComSpace, Dallas, on April 3, 2000, to purchase and test-market ComSpace's digital technology, DCMA, in a selected market. DCMA can be selectively implemented where additional capacity is required either for additional users or added features. When implemented, it allows for an eight-fold increase in capacity for each analog channel.

Robert Moore, Chadmoore president, said, "We believe ComSpace's DCMA

technology is an exciting and affordable way to maximize the number of customers that can be served. It will also allow Chadmoore to provide greater functionality such as short messaging, data transmission and is scheduled to provide for the functionality for the new wireless applications protocol (WAP) applications for its customer base."



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## Portable radios

### Radio series uses Passport protocol

The RTX Plus series of radios from **Ritron** features conventional or trunking capability. Using the Passport trunking protocol, the electronic serial numbers facilitate automatic roaming between sites on a system or between affiliated networks. Direct frequency assignment eliminates recalling and reprogramming radios as the system grows, and field-reprogrammable Flash microcontrollers allow for custom applications. The RTX Plus series is designed to meet MIL-STD 810 C&D shock and vibration specifications. The radios permit as many as 11 channels in conventional mode, with 100 channels in any combination of 11 systems and groups in trunking mode.

Circle (351) on Fast Fact Card

### Portable offers IMBE technology

**Com-Net Ericsson Critical Radio Systems'** Jaguar 700P portable radio is Provoice-capable and offers IMBE vocoder technology for increased sound quality. The recessed emergency button prevents accidental activation, and the three-line display is designed for low-visibility situations. Optional software upgrades provide for 800 trunked system and group combinations and as many as 200 conventional channels. The Jaguar 700P can store 99 individual call ID numbers and 99 telephone interconnect numbers in memory per system. Aegis DES and VGE encryption upgrades are also available.

Circle (352) on Fast Fact Card

### Radios offer as many as 13 scan groups

The SP-200 series of programmable VHF/UHF portable radios from **Topaz3** offers 199 channels of communications and multiple scan modes. For continual access to information, the radios offer as many as 13 scan groups of 16 channels each. Selectable 1W or 5W output settings provide power for short- or long-range conversations. They are equipped with programmable CTCSS and DCS signaling formats and time-out timer settings. The radios offer a programmable scan list of group channels, priority lookback scan and priority channel edit. They are protected by a die-cast aluminum chassis and polycarbonate case, and they are equipped with a top-mounted, three-digit display, easy-grip on-off/

volume control knob, and dedicated scan/priority and monitor function buttons. Compatible accessories include a 1,350mAh NiMH battery pack, rapid-rate charger, ear bud speaker with in-line push-to-talk and microphone, lapel speaker/microphone with ear jack and ear speaker with cord for use with lapel speaker/microphone.

Circle (353) on Fast Fact Card



### Lowband portable has eight-character display

The TK-190 lowband portable radio from **Kenwood** offers 6W, 16-channel capabilities. It features priority scan, eight-character alphanumeric LCD, programmable keys and toggle switch. The radio offers a mechanical channel selector, Flash ROM memory, and PC programming and tuning. The TK-190 meets MIL specification standards 810 C, D and E and is suited for use in wet-weather environments.

Circle (354) on Fast Fact Card



### Portables employ Smartrunk capability

The IC-F3S and IC-F4S radios from **Icom** employ Smartrunk II capability for telephone interconnect and unit-to-unit calling when used with the optional UT-105. As many as seven keys in Smartrunk II mode can be assigned functions for customized operation. Conventional mode with CTCSS and DTCS encode/decode is available for out-of-service areas, and the radios offer an optional two-tone decode or five-tone encode/decode feature. They can be connected to an IBM PC for advanced programming capabilities,

and they offer a six-character alphanumeric display. The radios also offer time-out timers (TOT) and a selectable five-tone format. The LCD backlight has three selectable conditions: off, auto or continuously on.

Circle (355) on Fast Fact Card





## READERS' CHOICE

Of the new products in the November 1999 issue, this one generated the biggest reader response. For more information on this product, circle the corresponding Fast Fact number on the card found in the back of this issue, and mail the card to us.

### Van antenna system hides in storage pipe



STI-CO Industries' discreet antenna system for law enforcement operations comes in a surveillance vehicle disguised as a contractors' van. Its rooftop "storage pipe" contains a custom-engineered system that includes multiple, working antennas

specifically tuned to operational requirements. The system provides upgrade alternatives to existing van installations. The completely disguised tubular enclosures make adapting off-the-shelf antennas unnecessary, and they eliminate the need for multiple external antennas. The antennas have built-in ground planes and require no field tuning. They provide unobstructed omnidirectional communications, unlike antennas used inside the vehicle.

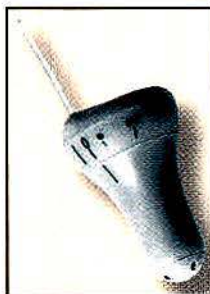
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### Earpiece has automatic squelch, noise filtering

Motorola's completely discreet earpiece is designed for use with Motorola two-way radios and surveillance kits by police officers, public safety officials and security operatives. Users can transmit communications through the wireless earpiece via an inductive neckloop connected to a Motorola two- or three-wire surveillance kit. Its small size is designed to enable the user to monitor radio transmissions without compromising undercover integrity. The earpiece offers a range of audio functions includ-

ing automatic squelch, automatic gain control and noise filtering. Average battery life is 100 hours, and the earpiece includes an end-of-life circuit that generates a warning signal when the battery needs changing.

Circle (401) on Fast Fact Card



### Connectors offer inner contact pins

Andrew's integrated Ringflare Onepiece connector family is designed for Heliac foam dielectric coaxial cable. The connectors have factory-preset captivated inner contact pins for guaranteed pin depth that needs no verification or adjustment. The connectors' prelubricated integral O-ring-to-cable seal, seated on the corrugated copper outer conductor of the coaxial cable, provides a weatherproof seal. The weatherproofing of the new

connector series has been tested in mated and unmated conditions. The connectors are installed by preparing the cable to correct trim dimension, pushing the connector onto the cable and tightening the connector to the proper torque level. The connectors are compliant with MIL, EIC and DIN specifications, and qualifications and have guaranteed electrical, mechanical and environmental performance.

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Circle (43) on Fast Fact Card

## Repeaters offer Tonelock decoding



Topaz3's models SR-4000U and SR-4000V of Maxon repeaters are equipped with duplexers and have a maximum capacity of 50 CTCSS and 104 DCS user groups. The SR-4000 series offers Tonelock decoding, database and validation for 154 users and repeat audio processing. It also has CTCSS/DCS and cross-tone encode, vacant tones and reversible tones, reverse burst and DCS turnoff code for squelch tail elimination. Programmable features include repeater time-out timer settings and Morse code station ID.

Circle (403) on Fast Fact Card

## Modem employs encrypted network

The Expedite Wireless IP Modem from Novatel Wireless is a 0.6W full duplex wireless modem almost four times smaller than the previous model. It can be used to transmit location, system or safety monitoring information from remote areas to a central processing station or from point to point. The modem sports a raw data transfer rate of 19.2 kbps and uses the encrypted CDPD network for sending secure transaction data. It is powered by a 3.6V supply and is equipped with a 24-pin 0.05" dual row header data port.

Circle (404) on Fast Fact Card

## Docking station offers surge protection

The Panasonic CF-27 docking station from Gamber-Johnson is designed for the Panasonic CF-27 computer and made up of the Panasonic Port Replicator for the CF-27 series of personal computers, Lind Automobile Power Adapter and a mounting interface plate. The port replicator features a docking engagement latch, security lock, two serial ports and a USB port. The power adapter features power surge protection, a power input regulator and protection from dust, moisture and high humidity.

Circle (405) on Fast Fact Card

## Transmitter offers motion detector

The Quick Talk Lookout from Ritron is a FM radio transmitter with an integral infrared motion detector designed for use in normally unattended areas such as schools, hospitals and parking structures. It transmits using recordable voice messages over existing two-way radio systems. The transmitter is wireless and operates on six AA alkaline or NiCd batteries. It automatically transmits a prerecorded, voice-alerting message whenever the infrared beam is disturbed.

Circle (406) on Fast Fact Card

## Combiner works indoors and out

The KC1009 dual-band combiner from Kathrein, Scala Division combines cellular/trunking and PCS/PCN on one transmission. The coupler is designed for either indoor or outdoor use. If desired, two units can be mounted back-to-back. It operates in the 800MHz-1000MHz range. It is 10.8" x 5" x 3" and requires four screws for installation.



Circle (407) on Fast Fact Card

## Receiver records up to 16 seconds

The Visiplex VP-Audio/Data Receiver from Visiplex provides a wireless method to selectively monitor and decode paging transmissions sent from any POCSAG or Visiplex encoder. The receiver enables recording and playback of audio information transmitted by the same encoder. It accepts as many as 256 characters or digits and records 16 seconds of voice. It offers password activation protection and is capable of three baud rates: 512, 1200 and 2400. The receiver is for use in generating serial messages to remote LED alphanumeric sign boards.

Circle (408) on Fast Fact Card



## Mounting kits convert mobile antennas

Antenna Specialists' KTF-630 and KTF-670 temporary fixed-station mounting kits are designed for use with Antenna Specialists' Mosaic VHF mobile antennas and UHF mobile antennas, respectively. The kits convert mobile, omnidirectional antennas to fixed-station, general-purpose use and allow operators to select the specific power handling, gain and bandwidth needed. Each mounting kit includes an adapter, radials and bracket hardware to create

the fixed-station mount. The N female connector input mount allows a mobile antenna to be mounted directly into an all-brass, nickel-plated, Teflon dielectric interface. Cutting charts are supplied.



Circle (409) on Fast Fact Card

## Console equipped with modular DTLM



The Vega C-1610 six-line console from Telex Communications is a DSP microprocessor-based, multiline, full-featured desktop radio control console with a modular dual-sequential, ton-line modules (DTLM)

card to provide as many as six control lines. Two lines can be connected to each DTLM card. Any line can be configured for either a dedicated two- or four-wire full-duplex circuit or E & M. The console offers squelch and line activity indicators that flash when detecting audio. An optional desk microphone, headset, handset or gooseneck are available.

Circle (410) on Fast Fact Card

## Recorder displays ANI, ALI information

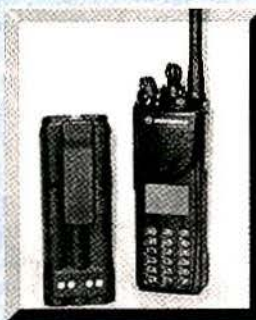
The VCR-1964 from Exacom is an enhanced digital voice recorder designed to assist communications and emergency services workers by offering instant playback of recorded calls. Communications are recorded with a time stamp and may be played back instantly to verify important information. The system is universally compatible with telephone and radio communications systems. When used in applications such as E9-1-1, it can record and display ANI and ALI information along with the voice recording for all incoming calls. It is



compatible with automatic call distributors (ACDs), and it offers a built-in 10-minute battery backup.

Circle (411) on Fast Fact Card

## Battery packs provide high-impact housing



Alexander Technologies' replacement battery packs for Motorola's XTS3000 radios come in two styles.

The H8294 is a 1,700mAh NiCd pack, and the H8299 and H8299XT

are NiMH packs rated at 2,000mAh and 3,600mAh, respectively. The batteries have ultrasonically sealed, high-impact housings and are built to meet or exceed OEM specifications. The batteries' nominal voltage is 7.5V, and the operation voltage range is 6.0V-9.0V. Each cell is safety-vented to provide rapid release in high-pressure situations. The vents can be resealed in the event of venting. The batteries also offer rapid charging.

Circle (412) on Fast Fact Card

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Circle (46) on Fast Fact Card

## Transceivers support 999 (+1) channels

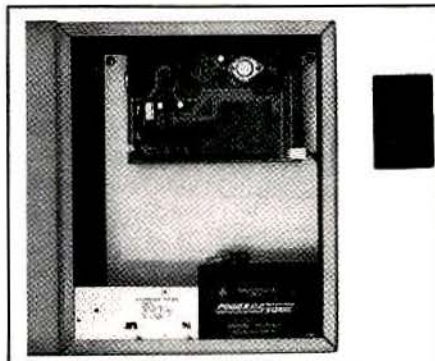
VHF/FM portable transceivers with internal 12-channel GPS/DGPS receivers from **Command Radio** are designed for professional safety service and commercial fleet operators requiring advanced fleet management capabilities. Both the DS250 and DS350 models are capable of wideband (25kHz) and narrow-

band (12.5kHz) operations and accept FCC LMR and NTIA channels. Both support 999 (+1) channel capacity and dynamically sized channel groups. CTCSS and CDCSS encode/decode, DTMF/ANI and digital selective calling are supported in both models.

Circle (413) on Fast Fact Card

## Control system offers access to remote sites

The Gatekeeper+ from **PageTek** is an integrated site access control system designed for controlling and monitoring access to remote sites by personnel with a variety of access privileges. The Gatekeeper+ has inputs for detecting intrusion or monitoring site environments and can be accessed remotely via a modem connection to an integrated 14400 baud modem or locally, via a RS-232 port. It can be programmed to automatically alert management of site conditions. It will send alerts in case of intrusion using a separate security calling sequence and will sound a local alarm. The system is configured for



120Vac with a 48-hour dc backup supply and 12Vdc strikes, but can be adapted to individual site requirements.

Circle (414) on Fast Fact Card

## Amplifier system provides default bypass

The Smartbackup system from **TX RX Systems** is a 746MHz-901MHz tower-top amplifier (TTA) system that provides redundant pin diode-switched LNAs and a default bypass mode with switching and reporting, all via the single RF coaxial cable connection. The system is housed in a 6" x 6" x 24" stainless-steel, weather-tight enclosure.

The alarm, monitoring and control panel is integrated with a multicoupler system with a high third-order intercept point and take one rack unit of mounting space for as many as 12 outputs. Each TTA includes an integral high performance preselector optimized for the service band being supported.

Circle (415) on Fast Fact Card

## Channel emulator offers DEE capability



The TAS 4500 Flex5 RF channel emulator from **Telecom Analysis Systems** features dynamic environment emulation (DEE), which allows time-varying emulation for real world conditions in the lab. DEE enables users

to synthesize complex, time-varying propagation environments or to playback large files imported from actual field measurements. DEE varies channel parameters including Doppler shift, delay speed, path loss, modulation type and channel loss at precise time intervals. For comprehensive system test applications, DEE synchronizes fading and multipath characteristics across multiple Flex5 instruments. All Flex5 models feature front panel controls as well as Taskit software for Windows PC control.

Circle (416) on Fast Fact Card



## PEOPLE



Sowards



Mathieu



Sternbenc



Irving

**Robert "Ken" Sowards**, executive vice president of operations for a division of Trinity Industries, Dallas, moves to senior vice president of operations for Decibel Products, Dallas.

**Edward Mathieu**, senior manager for North American Philips, advances to the position of director of marketing and business development for IFR Systems, Wichita, KS.

**Thomas E. Sternbenc**, senior vice president of sales and customer care at Cable & Wireless North America, Vienna, VA, accepts appointment to the position of president of Tower Distribution Technologies, Hampton, NH.

**Robert J. Irving**, administrative counsel for Rohr, Chula Vista, CA, advances to vice president and legal counsel for Cricket Communications, a subsidiary of Leap Wireless International, San Diego.

**Dan Spalding**, public relations manager for Proxim, Sunnyvale, CA, joins Digital Microwave, San Jose, CA as director of corporate communications.

**Mitchell H. Herbets**, senior vice president and general manager of Racial Communications, Rockville, MD, succeeds Mark Lipp, who joins the board of directors as president.

**David Morash**, vice president of Safeskin, San Diego, moves to Wireless Knowledge, San Diego, as chief financial officer.

**Kathy Boyd**, general manager of Hewlett Packard's consulting services, assumes position of vice president of performance optimization group for TTC, Germantown, MD.

**Jeff Fisher**, operations manager for Solectria, Wilmington, MA, joins Advanced Charger Technology, Atlanta, as assistant general manager, hardware applications.

## CORRECTIONS

In the May 2000 issue, a headline in the "Product Focus" department for **Maxrad's** new line of directional panel antennas incorrectly claimed the antennas serve PCS and WLAN. The headline should have read "Directional panel antennas cover 800MHz to 900MHz spectrum."

Also in the May 2000 issue, the article "Emergency Central" incorrectly referred to **Racial Recorders'** digital voice logging recorder as "Voice Pro." The correct name is "Wordnet."

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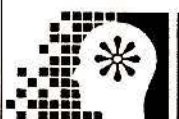
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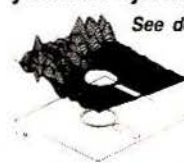
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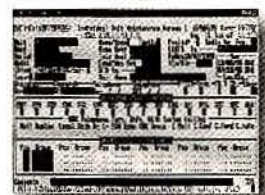
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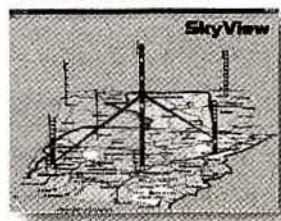
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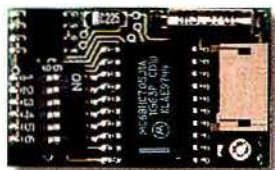
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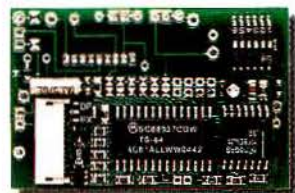




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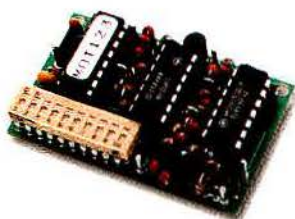
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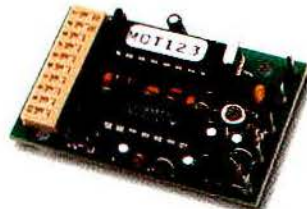
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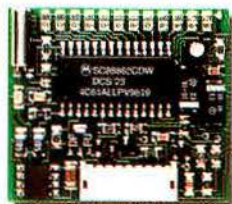
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